

47FT MOTOR LIFEBOAT OPERATOR'S HANDBOOK

U.S. Department of
Homeland Security

United States
Coast Guard



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COMMANDANT INSTRUCTION M16114.25B

Subj: 47FT MOTOR LIFEBOAT OPERATOR’S HANDBOOK

1. PURPOSE. This Manual provides technical orientation, performance characteristics, and basic operating procedures for the 47FT Motor Lifeboat (MLB). It also standardizes boat outfit, storage and equipment layout.
2. ACTION. Area, district, and sector commanders, commanders of maintenance and logistics commands, commanding officers of integrated support commands, commanding officers of headquarters units, assistant commandants for directorates, Judge Advocate General and special staff elements at Headquarters shall ensure compliance with the provisions of this Manual. Internet release is authorized.
3. DIRECTIVES AFFECTED. The 47FT Motor Lifeboat Operator’s Handbook, COMDTINST M16114.25A is cancelled.
4. DISCUSSION. This Manual contains information necessary to safely and efficiently operate the 47FT MLB. The operational capabilities, limitations, and emergency procedures are clearly stipulated. The fittings, outfit list, and physical characteristics of the boat are pictured and described in detail. This Manual is directive in nature and applies to all 47FT MLB crews, operational, and supervisory commands.
5. SUMMARY OF CHANGES. This revision provides new policies and procedures, makes modification and clarification to other existing policies, and makes several minor clerical changes. The majority of these changes originated from feedback received from the field. In addition to illustrations that were replaced throughout the Manual, the following major areas of change were made:

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B	*	5	10		*	2		2	10					*											1	
C											2													1	5	
D				*				150												1						
E								1									5		1							
F																										
G																										
H																										

NON-STANDARD DISTRIBUTION LIST: See Page 4

COMDTINST M16114.25B

- a. Chapter 2, Section A Changes made to reflect accurate characteristics data.
- b. Chapter 2, Section B Console figures updated from line drawing to pictures.
- c. Chapter 2, Section C Operating Station figures updated from line drawing to pictures.
- d. Chapter 3, Section B DDEC System figure updated.
- e. Chapter 3, Section C Raw Water System figure updated.
- f. Chapter 3, Section D Engine Coolant System and Engine Lubrication System sections updated.
- g. Chapter 3, Section E.3 Fuel oil return step/action and Fuel System figure updated.
- h. Chapter 3, Section F Steering System figure updated.
- i. Chapter 3, Section H AC/DC power sources, batteries, 24/120 VDC and VAC Power Panel figures updated.
- j. Chapter 3, Section I Engine Room Fire Suppression System and Bilge Pump System figures updated. Bilge Flood Alarm System operations and Firefighting policy updated.
- k. Chapter 3, Section J Communications/Navigations new section added.
- l. Chapter 3, Section K Weapons Mounting new section added.
- m. Chapter 4, Section G Safety Equipment section updated.
- n. Chapter 5, Section A Operating Parameters section updated.
- o. Chapter 6, Section A Starting Procedures section updated.
- p. Chapter 6, Section D Surf Operations section updated.
- q. Chapter 6, Section H Personnel Recovery caution updated.
- r. Chapter 6, Section I Ice Conditions warning updated.
- s. Chapter 6, Section J Securing Procedures updated.
- t. Chapter 7, Section B Striking a Submerged Object section changed to Collision with Submerged Object (or Bottom) and updated.

- u. Chapter 7, Section C.I Section C. Steering Casualty changed to reflect two individual sections: Section C.I. Steering Casualty (Hydraulics) and Section C.II. (Steering Casualty (Electrical)).
- v. Chapter 7, Section D Reduction Gear Failure section updated. Three action steps added.
- w. Chapter 7, Section E Fire in the Engine Room section updated. Six action steps added.
- x. Chapter 7, Section F Fire in the Auxiliary Machinery Space section updated. Two action steps added.
- y. Chapter 7, Section G Loss of Control of Engine RPM section updated. Four action steps added.
- z. Chapter 7, Section H Loss of Fuel Oil Pressure section updated. Three action steps added.
- aa. Chapter 7, Section I Loss of Lube Oil Pressure section updated. Two action steps and one NOTE added.
- bb. Chapter 7, Section J Main Engine High Water Temperature section updated. Four action steps added.
- cc. Chapter 7, Section K Excessive Shaft Seal Leakage section removed. Low Voltage Alarm/Loss of Electrical Charging System section added.
- dd. Chapter 7, Section M Hard Grounding section added.
- ee. Appendix B Updated ECR List.
- ff. Appendix C Forward Compartment, Gear Space, Engine Room, Open Bridge, Main Deck, Hull, Dockside Trials Port/Starboard Engine, and Underway Trials Port/Starboard Engine check lists updated.
- gg. Appendix D Disabling Casualty section updated.
- hh. Appendix E Restrictive Discrepancies section updated.
- ii. Appendix F 47FT MLB Full Power Trial Procedures section updated.
- jj. Acronyms Acronyms section added.

6. PROCEDURE. District, operational, and unit commanders for all units with a 47FT MLB shall ensure the procedures and limitations detailed within this Manual are followed. Boat crews shall become familiar with the changes made within this handbook, but are not required to recertify solely based on changes within this revision. Forward any comments, corrections, recommendations, and questions regarding this Manual to the 47FT MLB Facility Manager in accordance with Section 1.C. of this Manual. Design and structural change requests shall be submitted as outlined in the Naval Engineering Manual, COMDTINST M9000.6 (series).
7. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS. Environmental considerations were examined in the development of this Instruction and have been determined to be not applicable.
8. FORMS AVAILABILITY. None.

ROBERT C. PARKER/s/
Rear Admiral, U. S. Coast Guard
Assistant Commandant for Operations Capability

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CHAPTER 1 INTRODUCTION

Introduction This handbook contains information necessary for the safe and efficient operation of the 47FT Motor Lifeboat (MLB). It defines operational capabilities, limitations, and emergency procedures. In addition, it shows or describes the fittings, outfit list, and physical characteristics of the boat.

In this Chapter This chapter contains sections.

Section	Topic	See Page
A	Warnings, Cautions, and Notes	1-3
B	Facility Manager	1-5
C	Changes	1-7
D	Action	1-9



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Section A. Warnings, Cautions, and Notes

Introduction The following definitions apply to Warnings, Cautions, and Notes found throughout the handbook.

A.1. Warning **WARNING** 

Operating procedures or techniques that must be carefully followed to avoid personal injury or loss of life.

A.2. Caution **CAUTION!**

Operating procedures or techniques that must be carefully followed to avoid equipment damage.

A.3. Note **NOTE** 

An operating procedure or technique essential to emphasize.



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Section B. Facility Manager

Introduction

Commandant (CG-731), the Office of Boat Forces, is the facility manager for the 47FT MLB. The 47FT MLB is a standard boat as defined in the Boat Management Manual, COMDTINST M16114.4 (series), and the Naval Engineering Manual, COMDTINST M9000.6 (series). The National Motor Lifeboat School (NMLBS), through the Standardization (STAN) Team, provides expertise in all aspects of the 47FT MLB's operation and maintenance. The STAN Team reviews the boat, its equipment, crew procedures, operational reports (CASREPS, AOPS/TMT, etc.), and technical manuals continuously to update the information in this handbook.



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Section C. Changes

Introduction

Commandant (CG-731) promulgates this handbook and its changes. Submit recommendations for changes to Commandant (CG-731) via standard memo or electronic mail. For more information, contact Commandant (CG-731), 47FT MLB Facility Manager.

The address for Commandant (CG-731) is:

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U. S. Coast Guard Headquarters
2100 Second Street, SW
Washington, DC 20593-0001

Attn: 47FT MLB Facility Manager

C.1. Engineering Changes (EC)

All Engineering Changes (EC) issued since the 47FT MLB has been in service are provided in Appendix B. ECs approved after the promulgation of this handbook supersede information in the 47FT MLB Operator's Handbook, where applicable.




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Section D. Action

Introduction Operating, supervisory, and maintenance support commands and boat crews will comply with the procedures and limitations specified in this publication and any duly issued changes.

D.1. Configuration Control Configuration control for the 47FT MLB is critical for standardization of equipment and safety of operations. The boat's speed, performance and range characteristics are extremely sensitive to excess weight.

NOTE  To maintain fleet wide standardization, unit commanders shall not change or vary the type or location of equipment carried except where noted. Design or structural alterations are prohibited unless specifically authorized by the Office of Naval Engineering, Commandant (CG-45).

NOTE  Prototype testing of 47FT MLB configuration changes may only be carried out with the specific authorization of the Office of Naval Engineering, Commandant (CG-45). Under most circumstances, prototype testing is done at the National Motor Lifeboat School.



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CHAPTER 2

BOAT CHARACTERISTICS

Introduction This chapter describes standard 47FT MLB features. The systems described briefly in this chapter are covered in detail in Chapter 3 – Boat Systems.

NOTE

All illustrations in this Operator's Handbook are for familiarization only. The location of machinery and equipment in these illustrations may not accurately reflect proper placement and installation. Refer to the appropriate blueprint, NE-TIMS, technical publication or enclosure to this handbook for proper placement.

In this Chapter This chapter contains the following sections:

Section	Topic	See Page
A	General Description	2-3
B	Watertight Compartments	2-9
C	Open Bridge	2-35
D	Mast Platform	2-39
E	Main Deck Equipment	2-41
F	Main Deck Stowage	2-43



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Section A. General Description

A.1. Design The 47FT MLB (**Figure 2-1**) was designed by the Boat Engineering Branch of the U.S. Coast Guard Engineering Logistics Center.

A.2. Manufacturer Textron Marine and Land Systems of New Orleans, LA, completed the detailed design and built the 47FT MLBs. The prototype craft (CG 47200) went into service in 1990. The pre-production boats (CG 47201 – CG 47205) were delivered in 1993-1994. The first production craft (CG 47206) entered service in 1997.

A.3. Missions The 47FT MLB is designed to perform mission activities in adverse weather and sea conditions. Its primary mission is surf/heavy weather SAR, but it is designed to support multi-mission operations.

A.4. Boat Specifications The following provides a list of all 47FT MLB boat specifications:



A.4.a. Physical characteristics

Hull Length	47' 11"
Length Overall	48' 11" (w/ rubrails)
Hull Beam	14' 0" (w/o rubrails)
Beam Overall	15' 0" (w/ rubrails)
Freeboard	
Bow	6' 8"
Amidships	2' 2" (Deck Recess)
Aft	7' 1"
Draft	4' 6"
Highest Points:	
Fixed	18' 6" (Radar antenna)
Unfixed	28' 4" (HF antenna)
Engines	Twin Detroit Diesel Electronically Controlled (DDEC) 6V92TA
Rated Horsepower	435 BHP at 2100 RPM
Reduction Gear	Reintjes WVS 234 UP, 2:1 reduction
Fuel Type	Diesel
Fuel Capacity	
100%	394 GAL
95% (usable)	373 GAL
Electrical Generation	Dual Alternators
Propellers	Fixed 4 bladed, 28" diameter, 36" pitch
Displacement	
Hoisting condition	40,000 LBS
(boat, full fuel, outfit; no crew or cargo)	

(Hoisting condition + 4 crew members @ 210 LBS ea)

Trailer Information

The 47FT MLB was not designed for transport on a boat trailer. Over-the-road delivery should be performed by a licensed commercial shipping company.

Potable Water Capacity	5 GAL
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A.4.b. Operating Characteristics and Parameters	Maximum Personnel (including crew)	34 (180 lbs each)
	Maximum Seas	30'
	Maximum Breaking (Surf) Seas	20'
	Maximum Winds	50 KTS
	Range (Cruising RPM in Calm Water)	200 NM
	Maximum Operating Distance from Shore	50 NM
	Maximum RPM	2100 RPM
	Maximum Speed	25 KTS
	Cruising RPM	1850 RPM
	Cruising Speed	20 KTS
	Towing Capacity (with 3 ¼" Towline)	150 Displacement Tons
	Towing Capacity (with 2" Towline)	50 Displacement Tons
	Ice Breaking Capability	Light Surface Ice

NOTE

Unit commanders shall comply with the minimum boat crew requirements when dispatching boats for Coast Guard operations in accordance with Volume I of the U.S. Coast Guard Boat Operations and Training (BOAT) Manual, COMDTINST M16114.32 (series). See Chapter 4 of this handbook for additional Crew Requirements.

NOTE

Feedback from the Original Equipment Manufacturer indicate that environmental temperatures for human endurance will be reached long before environmental temperatures adversely impact the mechanical functioning of the 47FT MLB. Unit and operational commanders shall perform a thorough risk assessment in accordance with the Coast Guard's Operational Risk Management Instruction, COMDTINST M3500.3 (series), when deploying the 47FT MLB in adverse weather conditions.

NOTE

Additional guidance on passenger capacity and stability can be found in section 5.A.6. of this manual.

A.5. Superstructure

The boat's superstructure is made of 5456 marine aluminum and contains the Survivors compartment, Enclosed Bridge, and Open Steering Station. It is fixed to the hull at Frame 3 (aft) and Frame 12 (forward). The mast platform is attached to the superstructure at Frame 3 and Frame 5. The radar antenna and fold down mast are connected to the mast platform.



A.6. Hull

The boat's hull is made of 5456 marine grade aluminum. The hull's design is deep-V planing from bow to stern with frames numbered from transom to bow. The deepest draft is 4' 6" at the propeller shaft strut extensions. The propulsion system is a "U" drive configuration. Each propeller shaft runs aft from the reduction gear, penetrates the hull between Frames 3 and 4, and carries a 28" x 36" four-bladed propeller.

A.6.a. Hull construction

The hull consists of $\frac{5}{16}$ " bottom plating, $\frac{1}{4}$ " side shell, $\frac{3}{8}$ " chine plates and $\frac{1}{2}$ " keel plate. The 47FT MLB has a fixed fender system (rubrails) to protect the exterior of the hull and other vessels during alongside work.



A.6.b. Hull reference points

Frames are numbered from transom to bow at roughly 30" intervals (varies somewhat from frame to frame).

Item	Location
Spray rails	Welded to the hull just above the waterline from the bow to Frame 11.
Boat's numbers, a Coast Guard identification stripe with emblem, and "U.S. COAST GUARD" in black letters (EC-002)	On each side of the hull between Frames 9 and 15.
Boat's number and station name in black letters (EC-002)	Displayed on the stern.
Fixed fenders or "rubrails" ("D" shaped ionomer foam attached to studs welded to the hull)	At the gunwale level from the bow to Frame 7, around the stern to Frame 1, and at the recess gunwale from Frames 3 to 9.
Survivors compartment sink discharge	Overboard port side at Frame 5, just below and aft of the recess step.
Overboard discharges for the bilge pumps	<ul style="list-style-type: none"> • Frame 11, starboard side (forward compartment); • Frame 9 port side (auxiliary machinery compartment); • Frame 3, port and starboard (engine room); and transom (lazarette).
Depth sounder transducer	Between Frames 7 and 8 to port of the fuel tank.
Speed log	Between Frames 7 and 8 to starboard of the fuel tank.
Sea suction valves	Between Frames 4 and 5 on both sides of the keel in the engine room.
Exhaust ports exit the hull	Between Frames 1 and 2, port and starboard sides, just above the waterline.
The boat's deepest draft	Between Frames 1 and 2, just aft of the tow post (at the shaft strut extensions).
Propellers	Directly under Frame 1.
Rudder posts	Penetrate the hull between Frame 1 and the transom.
Weld marks to mark the 3' waterline as measured from the keel	Each side of the hull fore and aft, centered 9 ³ / ₈ " forward of Frame 15 and 4 ³ / ₈ " aft of Frame 1.

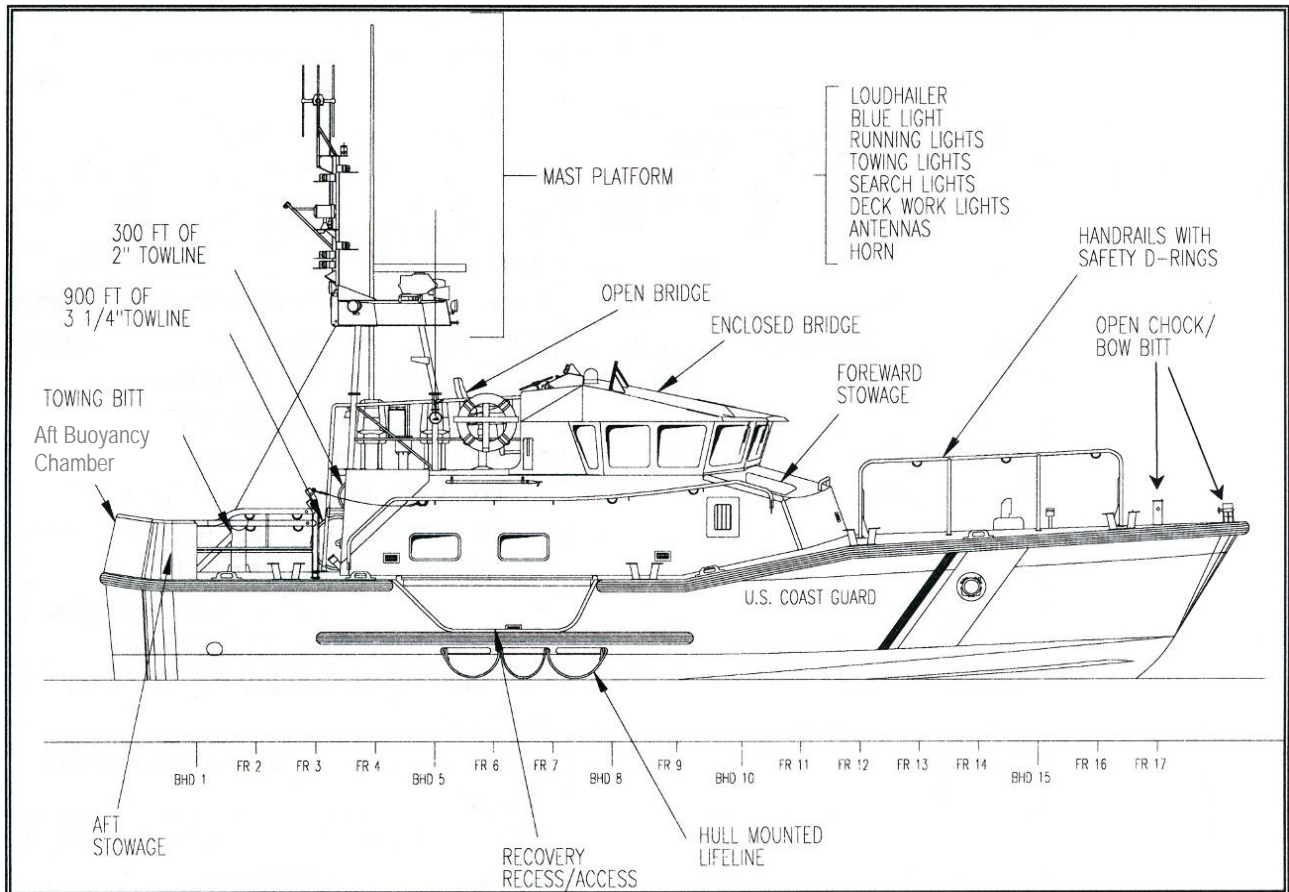


Figure 2-1
47FT MLB Outboard Profile



Section B. Watertight Compartments

Introduction

The 47FT MLB has seven main watertight compartments separated by bulkheads (**Figure 2-2**):

- Lazarette: Transom to Frame 1.
- Engine Room: Frame 1 to Frame 5.
- Survivors Compartment: Frame 5 to Frame 8.
- Auxiliary Machinery Compartment: Frame 8 to Frame 10.
- Forward Compartment: Frame 10 to Frame 15.
- Forward Peak: Frame 15 to bow.
- Enclosed Bridge: Frame 8 to Frame 10 above the main deck.

NOTE

47' MLB has natural ventilation to all compartments.

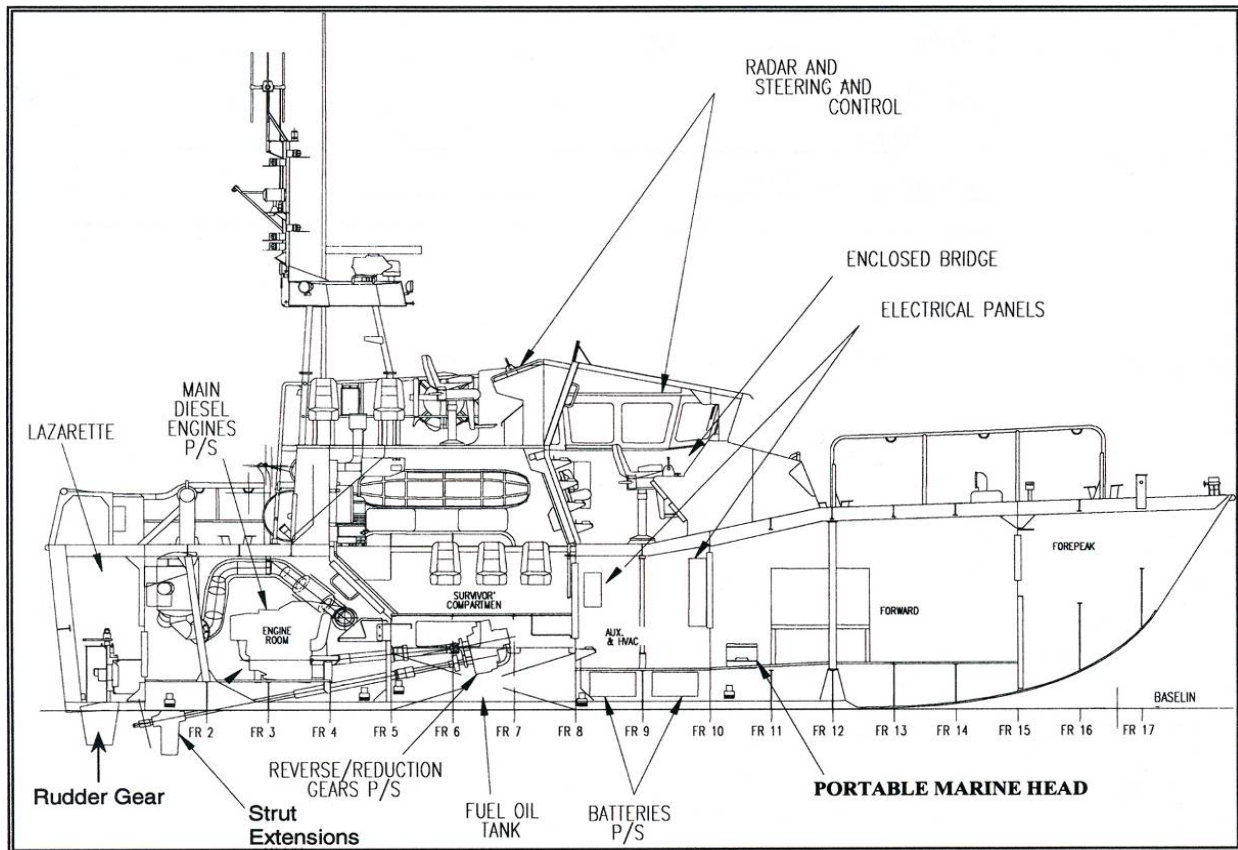


Figure 2-2
47FT MLB Inboard Profile



In addition, there are several secondary watertight compartments which aid in self-righting the craft in event of a capsizing. They are the Forward Deck Lockers, the Mast Platform, the Open Bridge Consoles and the Buoyancy Chamber.

In this Section This chapter contains general information on the following areas of the boat:

Topic	See Page
Forward Peak	2-11
Forward Compartment	2-12
Auxiliary Machinery Compartment	2-14
Survivors Compartment	2-17
Engine Room	2-23
Lazarette	2-26
Enclosed Bridge	2-28



Forward Peak

B.1. General

The Forward Peak, or forepeak, is a buoyancy chamber accessed through a 20" QAWTH at Bulkhead 15. The compartment is naturally ventilated with a 2" check vent. A drain plug is provided on the port side bilge accessed from the Forward Compartment.

(See Appendix B: EC-029)



Forward Compartment

B.2. Access	A quick-acting watertight escape hatch is in the weather deck at Frame 15 to starboard of the centerline. A T-handle wrench, stowed in the port forward deck locker, is used to open and close the hatch from above. A hand wheel operates the hatch from below. A safety catch secures the hatch in the open position. A QAWTD provides access to the Auxiliary Machinery Compartment on the centerline at Bulkhead 10.
B.3. Interior	The following items are found in the interior of the Forward Compartment (Figure 2-3):
B.3.a. Egress ladder	An egress ladder is to starboard of the centerline under the escape hatch on Bulkhead 15.
B.3.b. Stowage boxes	Stowage boxes are located on both sides of the deck grating at Frame 12. The port box contains spare oil (5 gallon 2104 and 1 gallon Tellus T-15 hydraulic) in approved and appropriate sized plastic containers, a damage control kit, and three sets of hearing protection. The starboard box contains four wool blankets, two pillows, a boat pyrotechnics kit in accordance with the Ordinance Manual, COMDTINST M8000.2 (series), a bell with clapper, a mouth-operated fog horn, a hand-held spotlight, and 10 blood-borne pathogen kits (sizes: 3XXL, 3XL, 2L, 2M).
B.3.c. Sanitary	A portable marine head is to port of the watertight door at Frame 10. A toilet paper dispenser is on the bulkhead.
B.3.d. Safety equipment	There are four adult type III PFDs with four Boat Crew Survival Vests, in accordance with the Rescue and Survival Systems Manual, COMDTINST M10470.10 (series) and the Ordinance Manual, COMDTINST M8000.2 (series). The boat crew survival vests may be stowed on port overhead handrail or readily available in Survivors compartment folded behind handrails. Four boat crew safety belts are secured on Bulkhead 15 or kept readily accessible secured to the handrails in the Survivors compartment .
B.3.e. Bilge pump	A 33 GPM electric bilge pump is starboard of the keel at Frame 10.



B.3.f. Loudhailer The loudhailer/intercom speaker is on the port side of Bulkhead 10 just below the overhead.

B.3.g. Ventilation The compartment is naturally vented. The forward dorade vent is between Frames 14 and 15 on the port side overhead. The aft vent is on the port side of Bulkhead 10.

B.3.h. PFDs There are five adult and five child type I PFDs secured on brackets on the starboard side of the hatch on Bulkhead 10 and shall be outfitted in accordance with Rescue and Survival Systems Manual, COMDTINST M10470.10 (series).

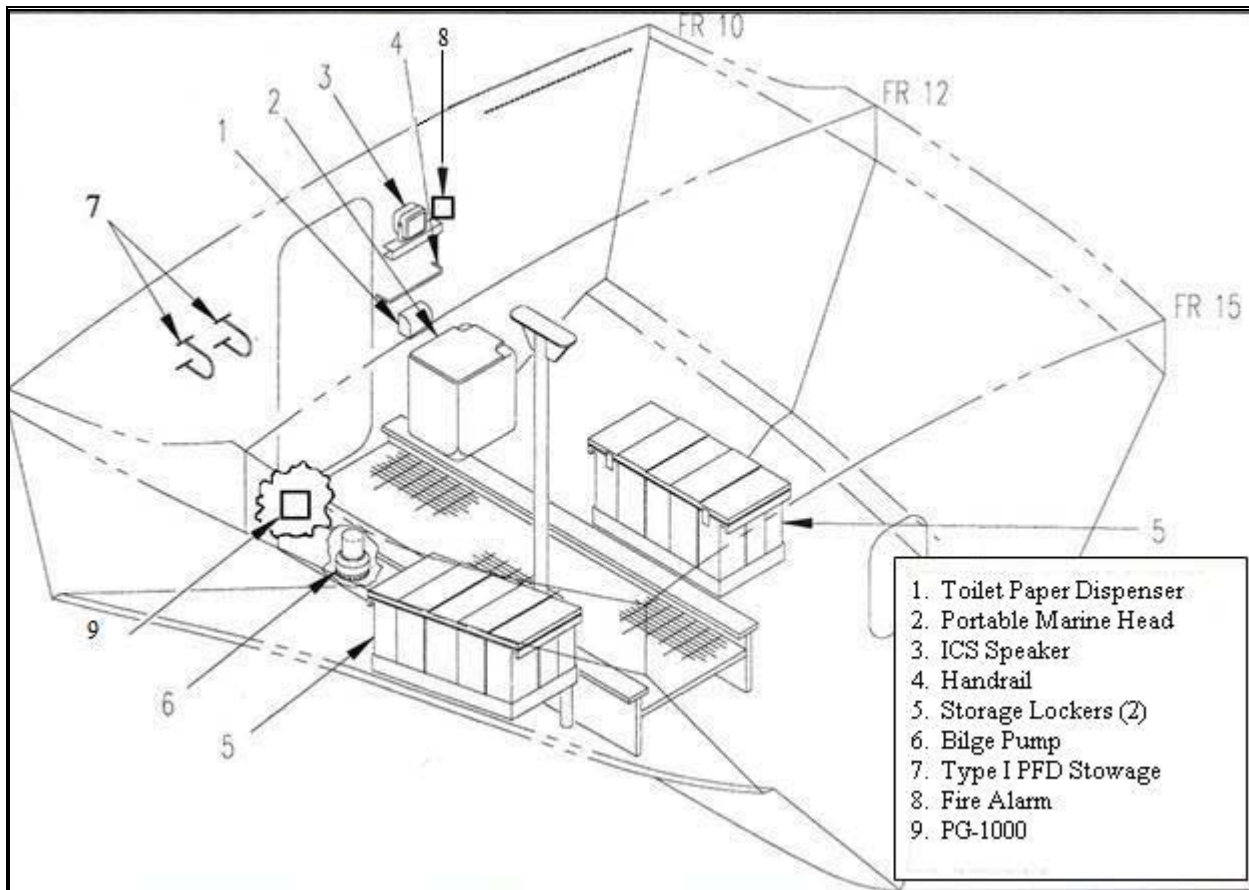


Figure 2-3
Forward Compartment



Auxiliary Machinery Compartment

B.4. Access A QAWTD provides access to the Forward Compartment at Bulkhead 10 on the centerline. A second QAWTD provides access to the Survivors compartment at Bulkhead 8 on the centerline.

B.5. Interior The following items are found in the interior of the Auxiliary Machinery Compartment (**Figures 2-4 and 2-5**).

B.5.a. Shore breaker power panel The shore power main circuit breaker panel is mounted on the port shell plating at Frame 9.

B.5.b. Bilge pump A 33 GPM electric bilge pump is at Frame 8 to starboard of the keel. The pump's overboard discharge is on the port side shell plating between Frames 8 and 9.

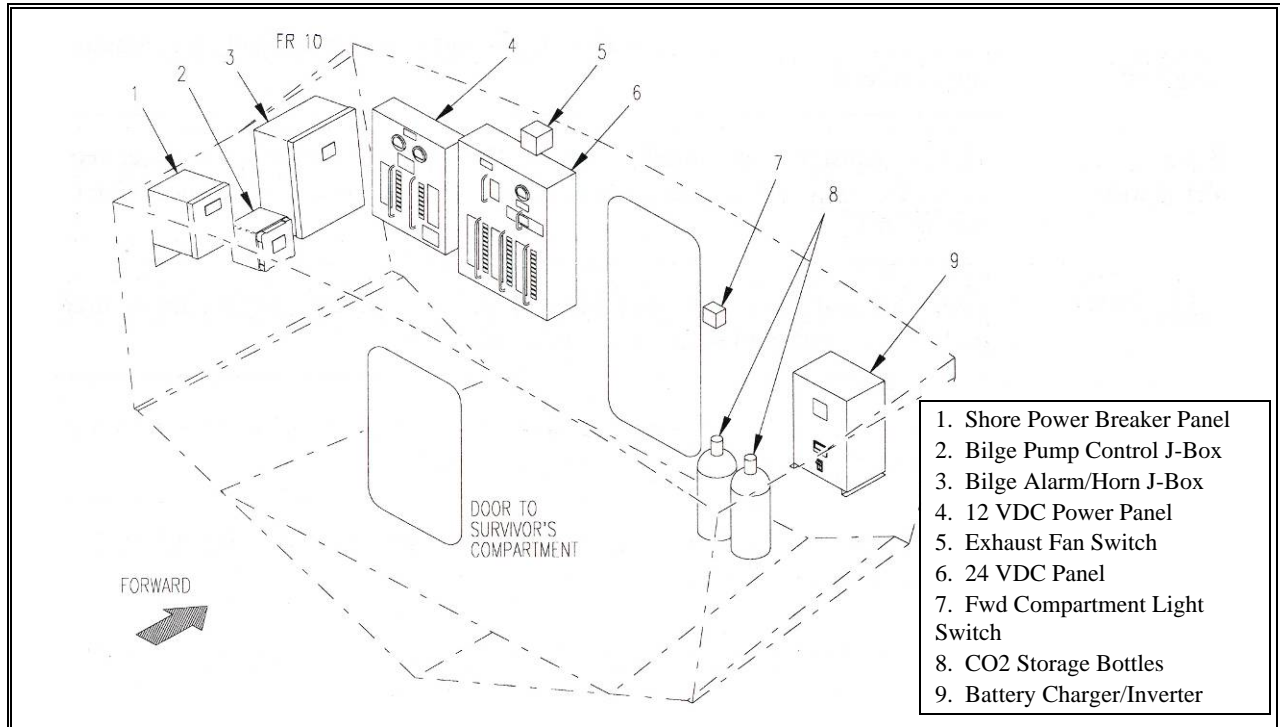


Figure 2-4
Auxiliary Machinery Compartment, Forward View



B.5.c. 12-Volt DC power panel	The 12-volt power panel is outboard of the 24-volt power panel on Bulkhead 10. In the top face of the panel are amperage and voltage meters. A 12-volt power converter is mounted on the inboard side of the 24-volt power panel with the breaker below the voltage and amperage meters.
B.5.d. Ventilation	The compartment uses forced ventilation. A vent fan and ducting are on Bulkhead 10 to starboard of the watertight door. Air intake ducting is on Bulkhead 8 to port of the watertight door. The exhaust fan switch is located on Bulkhead 10, above the 24-volt power panel.
B.5.e. 24-Volt DC power panel	A 24-volt power panel is on Bulkhead 10 to port of the watertight door. In the top face of the panel are amperage and voltage meters.
B.5.f. Lighting	A three-way light switch located in the Survivors compartment, starboard of the watertight door at Bulkhead 8, controls lighting for the Auxiliary Machinery Compartment.
B.5.g. CO ₂ fire suppression system	The CO ₂ fire suppression system includes two 25-lb storage bottles that are located on Bulkhead 10 starboard of the Forward Compartment watertight door.
B.5.h. DDEC controls	The DDEC Engine Room Interface Module and Electronic Gear Interface Modules (EGIMs) (2) are mounted on the starboard shell plating between Frames 8 and 9.
B.5.i. 120-Volt AC power receptacle	An AC power receptacle is located on the port side of Bulkhead 8, just outboard of the QAWTD.
B.5.j. Isolation transformer	The isolation transformer for the shore power system is mounted on Bulkhead 8 to port of the QAWTD.
B.5.k. 120-Volt AC power panel	The 120-volt power panel is on Bulkhead 8 port of the isolation transformer.



B.5.l. Batteries The service and start batteries are between Bulkheads 8 and 10 directly over the keel. They are 12-volt 8D cell marine batteries connected in series to provide 24 volts and are housed in individual battery boxes. Each bank operates independently of the other and can be connected using the parallel switch if one bank is dead. Battery control and parallel switches are located in the Survivors compartment space on Bulkhead 8. Deck grating is mounted over the battery boxes.

B.5.m. HVAC system The raw water valve, strainer and pumps for the HVAC system are mounted at Frame 9, to starboard of the battery box.

B.5.n. Emergency window release system (EWRs) The EWRs and Horn Compressor system is mounted on a pedestal on the outboard starboard side of Bulkhead 8. (See Appendix B: EC-034)

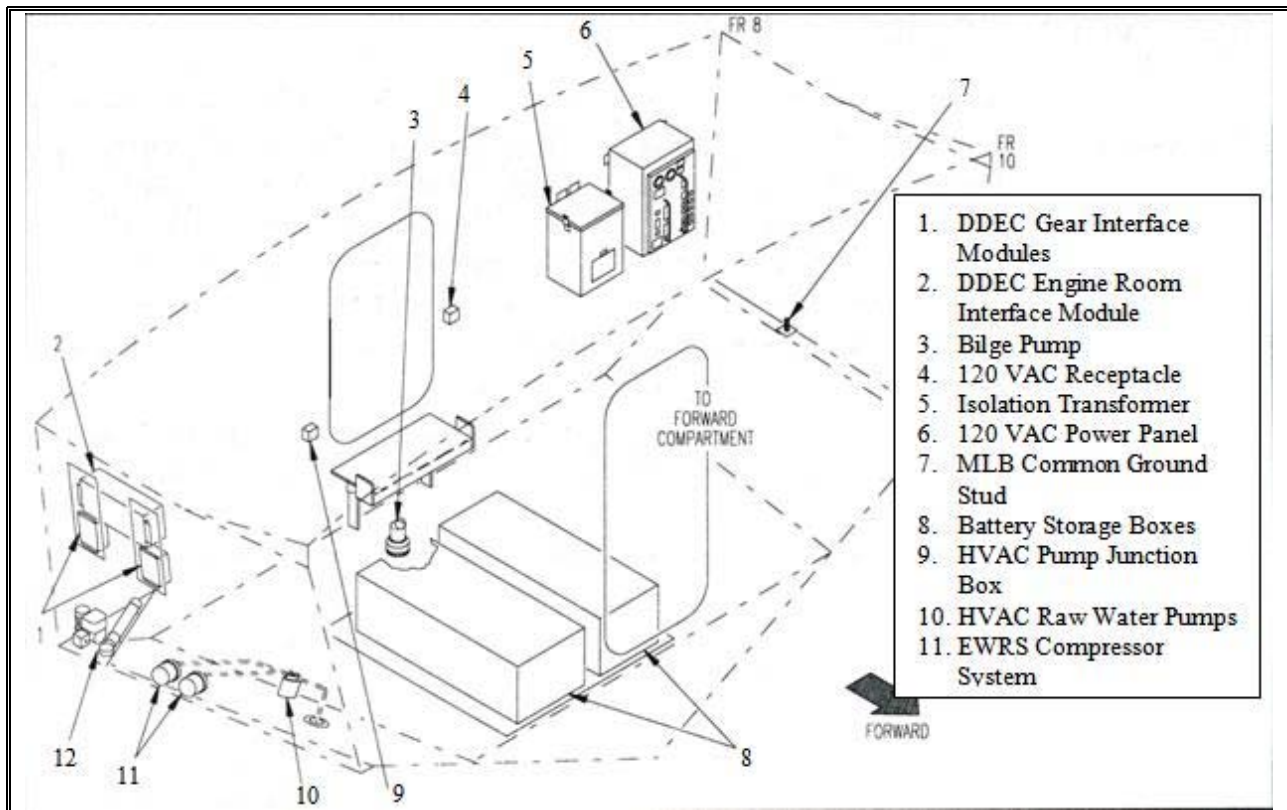


Figure 2-5
Auxiliary Machinery Compartment, Aft View



Survivors Compartment

B.6. Access A QAWTD provides access to and from the aft deck. This QAWTD is at Bulkhead 5 above the main deck on the starboard side of the compartment. A second QAWTD provides access to and from the Enclosed Bridge. It is located on the starboard side of Bulkhead 8 above the main deck.

B.7. Interior The following items are found in the interior of the Survivors compartment (Figures 2-6 and 2-7).

B.7.a. Seating The compartment has seating for five survivors, three on the port side and two on the starboard. The seats are jump seat style with safety belts at each position.
(See Appendix B: EC-013)

NOTE 

The port forward and aft seats are equipped with a third seatbelt attached to the seat pan to be used as a diagonal strap to secure an injured survivor on the deck (Figure 2-8).
(See Appendix B: EC-005)

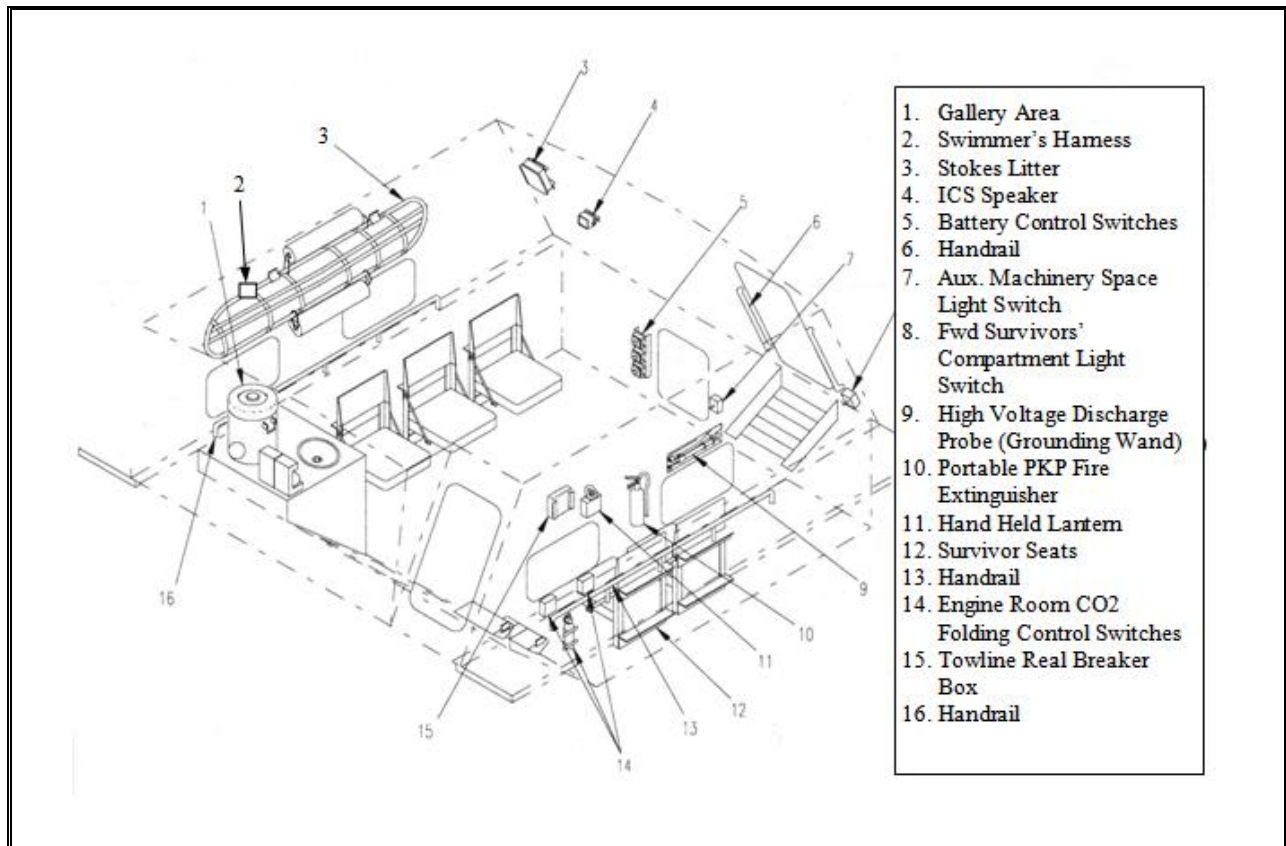


Figure 2-6
Survivors Compartment, Forward View

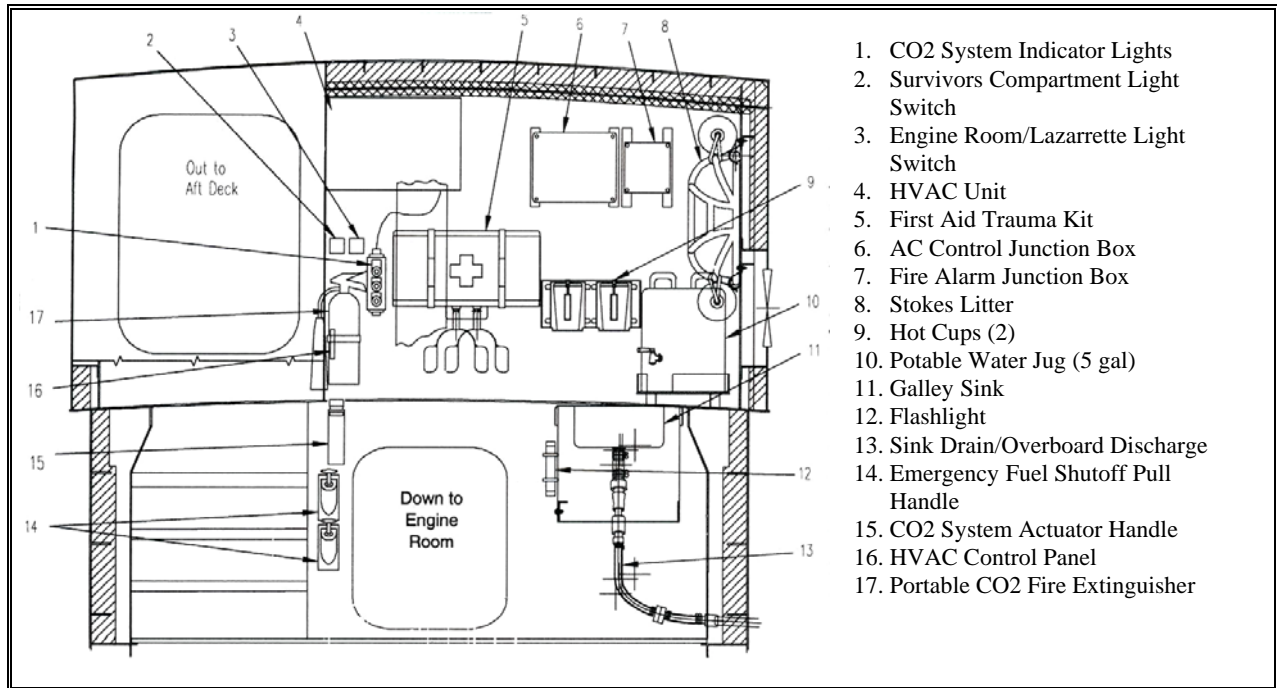


Figure 2-7
Survivors Compartment, Aft View



Figure 2-8
Survivor Secured To Deck



B.7.b. Galley A five gallon water jug secured by straps, sink and two hot cups are on the port side aft at Bulkhead 5. The sink has an overboard discharge.

NOTE 

The discharge from the galley sink leads directly overboard. Waste such as garbage and trash should not be sent down the sink.

B.7.c. Litter A stokes litter is secured on the port side above the windows. A rescue swimmer's pack is attached to the litter. Stowed with this should be a swimmer's mask, fins and safety harness in accordance with the Rescue and Survival Systems Manual, COMDTINST M10470.10 (series).

B.7.d. First Aid Trauma kit (FAT) A FAT kit is mounted on Bulkhead 5 over the watertight door to the engine room.

B.7.e. Hearing protection Two sets of muff style hearing protection are hung on Bulkhead 5 directly over the watertight door to the engine room.

B.7.f. Fire extinguishers A 5-lb CO₂ fire extinguisher is on Bulkhead 5 to port of the aft Survivors compartment watertight door. A 10-lb PKP fire extinguisher is on the starboard shelf at Frame 6.

B.7.g. Loudhailer The loudhailer/intercom speaker is on the port side of Bulkhead 8.

B.7.h. CO₂ fire suppression system CO₂ mechanical actuator is located starboard of the engine room door on Bulkhead 5. The 30-second discharge delay control head with manual activation lever is located on the starboard side bulkhead aft of the survivors seats. The CO₂ System Light Panel is located above the watertight door leading to the engine room.

B.7.i. Heating, Ventilation and Air Conditioning (HVAC) system A self-contained heating and air conditioning unit is located on the overhead in front of Bulkhead 5 above the engine room door. This unit provides heating, cooling and ventilation for the space. The control unit is located between the ladder leading to the aft deck and the watertight door leading to the engine room.

(See Appendix B: EC-022)



B.7.j. Battery system	On Bulkhead 8, port of the watertight door to the Auxiliary Machinery Compartment, are the service and start system battery cutout switches and the battery parallel switch.
B.7.k. Emergency fuel cut out valves	Remote fuel shut-off pull cables are located directly between the ladder leading to the aft deck and the watertight door leading to the engine room.
B.7.l. Ducting	Vent ducting on Bulkhead 8 passes through the Survivors compartment for the HVAC unit in the Enclosed Bridge. The ducting provides makeup air for under the port and starboard Open Bridge consoles.
B.7.m. Lighting	A three-way light switch for compartment lighting is located inboard of the watertight door leading to the aft deck; a second control switch is located outboard of the watertight door leading to the Enclosed Bridge. A hand-held battle lantern is mounted on the starboard bulkhead, above the aft window. A flashlight is mounted on the sink frame.
B.7.n. Tow reel controls	The tow reel breaker and reset switches are mounted on the starboard bulkhead above the aft window.
B.7.o. High voltage discharge probe	A high voltage discharge probe (grounding wand) is mounted on the starboard bulkhead above the forward window.
B.7.p. Deck	The deck in the Survivors compartment is removable. It is composed of eight separate locking panels and provides access to the equipment below.
B.7.q. Fuel tank	The diesel fuel tank is below the removable deck centered on the keel between Bulkheads 5 and 8. The tank has a 394 gallon capacity (373 gallons at 95% full). Baffles installed in the tank at Frames 6 and 7 control free surface effect. Three inspection covers evenly spaced across the top length give access to the tank.
B.7.r. Reduction gear	A Reintjes reduction gear is on each side of the fuel tank between Frames 6 and 7. The gear has a 2:1 ratio in forward and reverse. The reduction gear is coupled to the engine by a Cardan shaft. The Cardan shaft passes through a water restricting seal on each side of the bulkhead.



B.7.s. Shafts	Each 2.5" propeller shaft is connected to the stub shaft (spacer) which connects to the reduction gear output flange. The shaft enters the stern tube at Bulkhead 5 and exits the hull between Frames 4 and 3 in the engine room. Watertight integrity is maintained between the shaft and the stern tube by a PSS drip-less shaft seal.
B.7.t. Spare parts/chow boxes	An engineer's spare parts box and an optional chow box containing emergency rations are stowed and secured by belts in the center gear space on top of the fuel tank. (See Appendix B: EC-005)
B.7.u. Bilge pumps	A 33 GPM electric bilge pump is in each reduction gear space at Bulkhead 5 next to the fuel tank. The pump discharge piping penetrates Bulkhead 5 outboard of the port and starboard Cardan shafts. It is connected to the engine room bilge system discharge piping.
B.7.v. Depth sounder/speed log	The depth sounder and speed log transducers are to port and starboard (respectively) of the fuel tank between Frames 7 and 8.



Engine Room

B.8. Access	A QAWTD at Bulkhead 5 on the centerline provides access to the Survivors compartment. A QAWTD provides access to the lazarette at Bulkhead 1 on the centerline.
B.9. Interior	The following items are found in the interior of the engine room (see Figure 2-9):
B.9.a. Engines	Two Detroit Diesel 6V92TA DDEC right-hand rotating engines are mounted facing aft from Frame 3 to Frame 4.
B.9.b. Dual alternators and/or a generator	Each engine drives a 28-volt 220-amp Balmar alternator and a 5-kW generator. The alternator produces the boats electrical power. The generator provides power for the HVAC system. (See Appendix B: EC-012, 025, 037)
B.9.c. Raw water valves	Each raw water valve is located on the opposite side of the keel from the engine it serves, between Frames 4 and 5, below the ladder (Figure 2-9). (See Appendix B: EC-024)
B.9.d. Sea strainers	Port and starboard sea strainers are between Frames 4 and 5 on the port and starboard inboard girders (Figure 2-9).
B.9.e. Emergency fuel cut out valves	Fuel oil is drawn from the tank through two emergency fuel cut out valves. The valves are located between Frames 4 and 5 on either side of the keel.
B.9.f. Filters	The primary fuel filters are 30 micron, and are located between Frames 3 and 4 on the port and starboard inboard girders. The secondary fuel filters are located inboard of both engines with a micron rating of less than 10. (See Appendix B: EC-008)
B.9.g. DDEC system	A DDEC Marine Interface Module (MIM) and Engine Control Module (ECM) are mounted on both port and starboard engines.

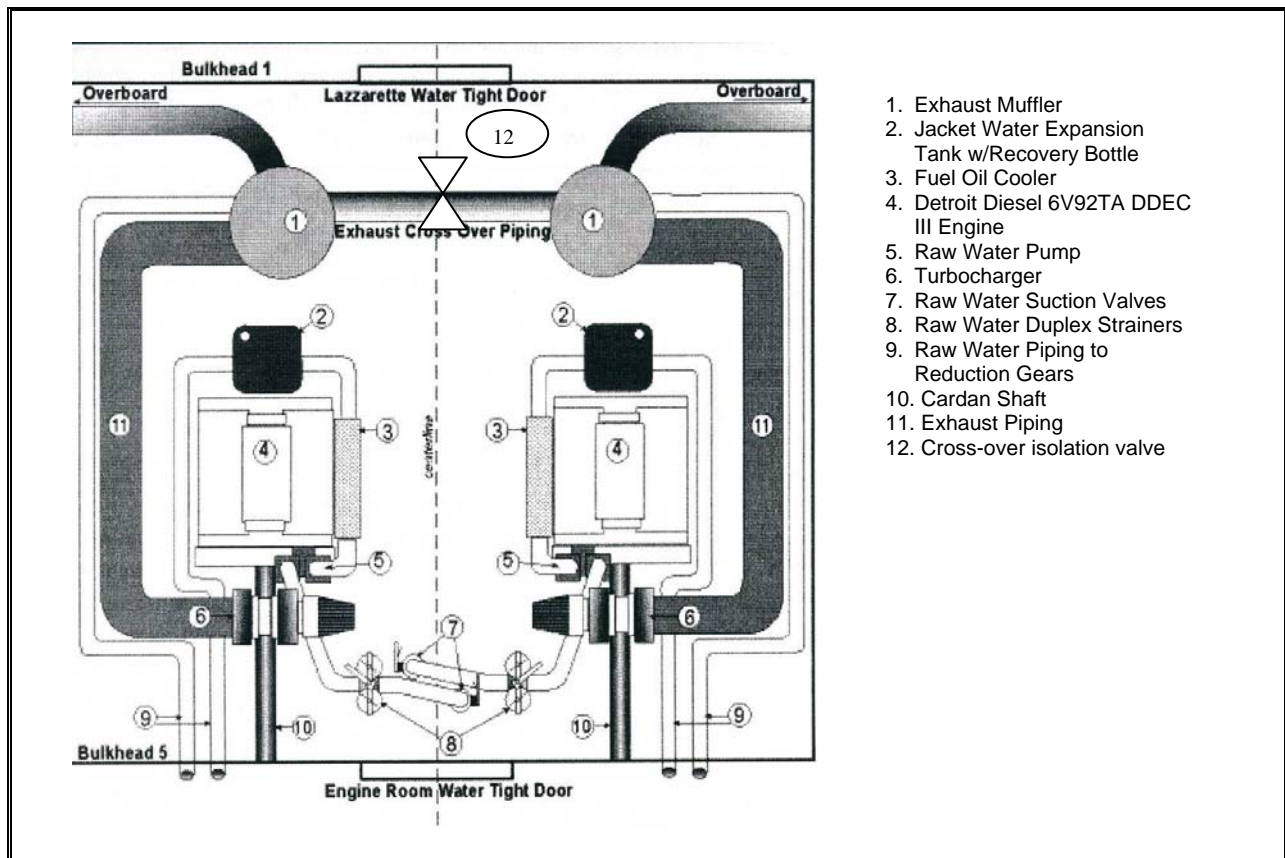


B.9.h. Hydraulic steering pump

A 6.5 GPM gear pump is driven by each engine. A separate electrically driven hydraulic pump mounted just above the chine at Bulkhead 2 supports the autopilot system.

B.9.i. Hydraulic fluid reservoir, filter (10 micron) and cooler assembly

are located below the overhead on the starboard side shell plating between Frames 2 and 3. Raw water is provided to this as a cooling agent from the starboard engine.



**Figure 2-9
Engine Room**



B.9.j. Bilge pumps Two 33 GPM electric bilge pumps provide engine room dewatering. One is located at Bulkhead 5 and the other is located between Frames 1 and 2. Pump discharges are piped overboard on the port and starboard sides. The discharge piping from the Survivors compartment connects to this system.

B.9.k. Tool box An engineer's tool box is secured in a bracket on the starboard side aft deck, directly under the muffler.

B.9.l. Standpipe A standpipe (equipped with a strainer) is located inboard of the starboard girder, forward of Bulkhead 1, is used with the CG-P6 dewatering pump for alternative engine room dewatering.

B.9.m. Exhaust system There are two water-cooled exhaust mufflers located on Bulkhead 1 outboard of the port and starboard girders. The mufflers are cross-connected to provide exhaust discharge when one port is under water. They can be isolated with the butterfly valve for single engine operations. Exhaust discharges through the shell plating between Frames 1 and 2 just above the water line.

(See Appendix B: EC-027)



Lazarette

B.10. Access Access to and from the lazarette is through a QAWTD on the centerline of Bulkhead 1.

B.11. Interior The following items are found in the interior of the lazarette (**Figure 2-10**):

B.11.a. Rudder posts Two rudder posts are located outboard of the port and starboard girders between the transom and Bulkhead 1. A packing gland is placed in the top of each rudder post to provide a watertight seal against the rudder stock. An aft leading tiller arm is attached to each rudder post.

B.11.b. Rudder tie rod attachment A tie rod attachment connects the port and starboard tiller arms.

B.11.c. Rudder angle indicators A manual steering rudder angle indicator sending unit is outboard of the port rudder post. A separate electrical rudder angle indicator sending unit for the autopilot system is inboard of the port rudder post. They both sense rudder position using a separate tie rod attachment to the port rudder quadrant and are adjustable. This information is sent to the autopilot course computer located in the Enclosed Bridge.

B.11.d. Servo power cylinder The servo power cylinder of the hydraulic steering unit is mounted between the starboard tiller and the centerline. The servo ram connects the power cylinder to the starboard tiller forward of the tie rod attachment.

B.11.e. Ventilation The compartment is naturally ventilated using a 2” check vent.
(See Appendix B: EC-018)

NOTE 

The aft ventilation piping for the engine room passes through this compartment. Modifications to this piping must be in accordance with EC-018.



B.11.f.
Standpipes

The raw water standpipe for the main deck CG-P6 pump fire fighting water penetrates the hull at a mid point between the shell plating and the starboard girder just aft of Bulkhead 1. The engine room dewatering standpipe penetrates Bulkhead 1 to starboard of the watertight door.

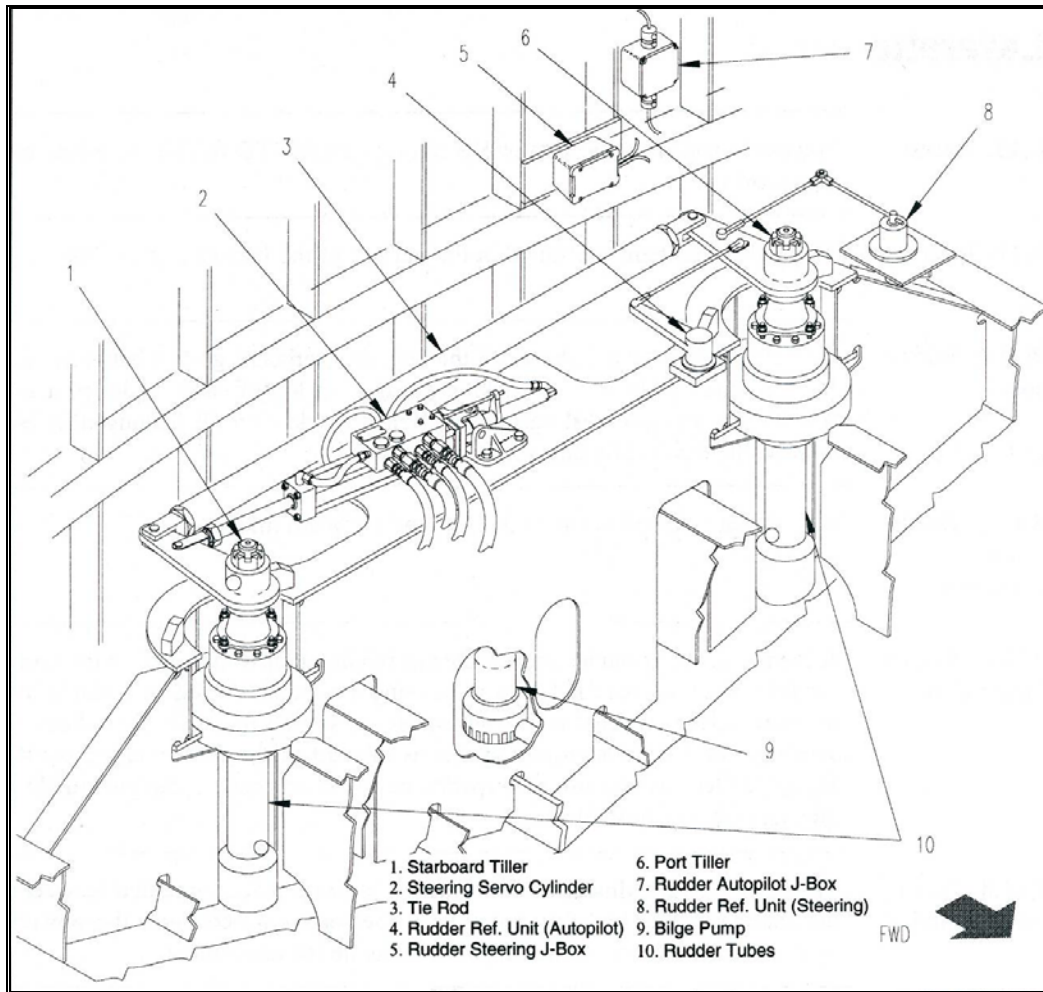


Figure 2-10
Lazarette



Enclosed Bridge

B.12. Access Two locations give access to the Enclosed Bridge. A QAWTD from the Open Bridge is to port of the centerline. A four-step aluminum ladder with handholds to either side of the door leads into the compartment. A QAWTD from the Survivors compartment is starboard of the centerline. The three-step aluminum ladder has handholds on both sides of the door.

B.13. Interior The following items are found in the interior of the Enclosed Bridge:

B.13.a. Seating The compartment has seating for four crew members. All seats are equipped with seat belts.

(See Appendix B: EC-005 and EC-009)

Seating Types		Position	Responsibility
<u>Helm chairs-</u> face the main console to port and starboard of the centerline	Port chair	Coxswain	The coxswain has both helm control and access to all navigation equipment.
	Starboard chair	Helmsman	The helmsman has both helm control and access to all communications equipment.
<u>Bolster seats-</u> port and starboard of the ladder leading to the Open Steering Station	Port chair	Crew Member	Both allow crew members a secure position with easy egress.
	Starboard chair	Engineer	



B.13.b.
Consoles

There are two console areas in the Enclosed Bridge. The upper console houses the Electronic Display Modules (EDMs), engine start switches and dimmer control switch (**Figure 2-11**). The lower console is divided into two parts (**Figures 2-12 and 2-13**). The main section contains navigation, communications and engine control equipment including the autopilot. A smaller sub-console sits directly on top of the main unit and houses all windshield wiper and heater controls. The central post between the forward windshields contains the depth/speed/heading indicator and the rudder angle indicator.

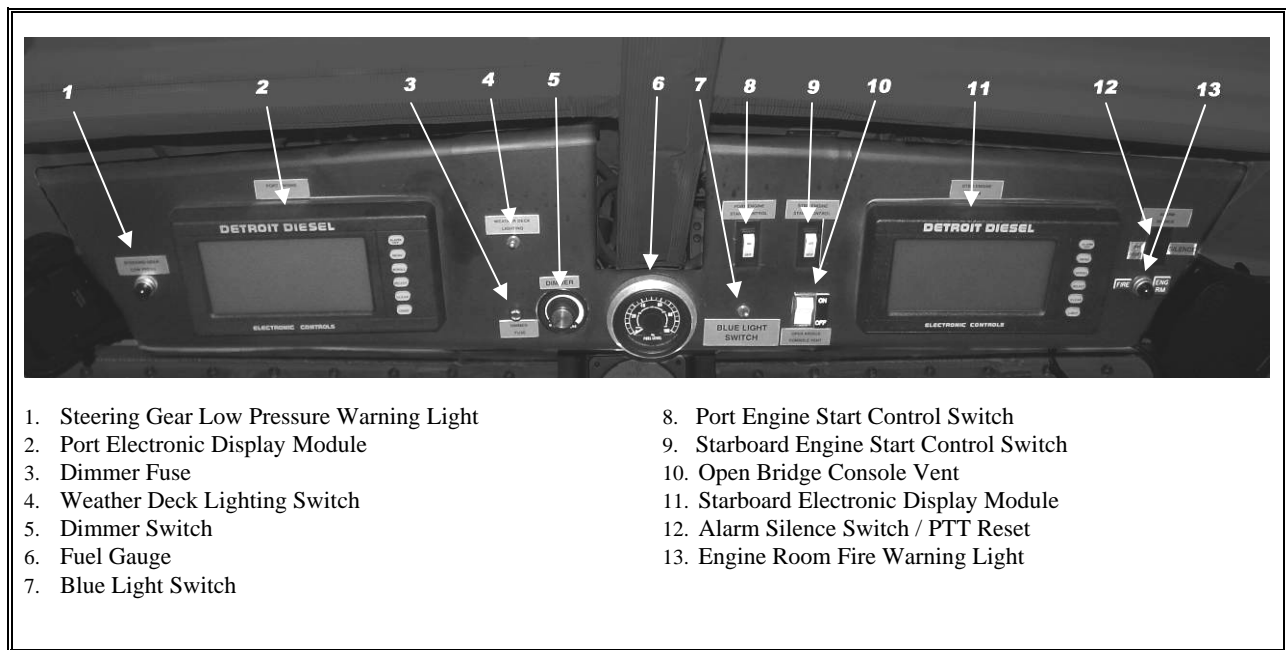
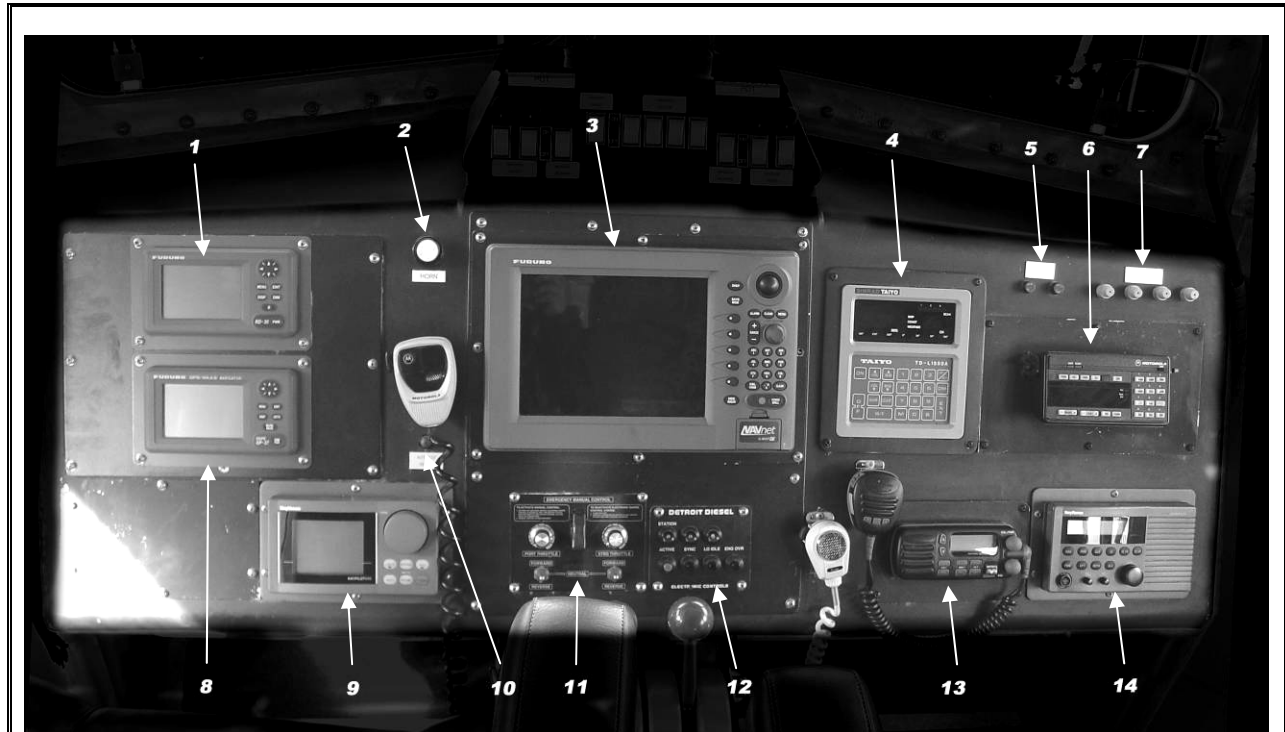
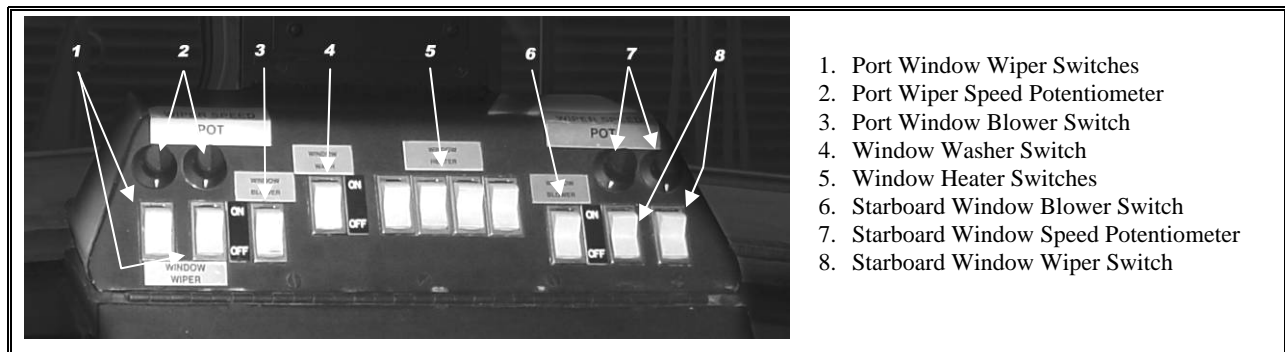


Figure 2-11
Enclosed Bridge - Upper Console



- | | |
|-------------------------------------|---|
| 1. WAAS/DGPS Receiver and Navigator | 8. RD-30 Multi-Display |
| 2. Horn | 9. Autopilot |
| 3. Radar Display / Chart Plotter | 10. Autopilot Select Switch |
| 4. Radio Direction Finder (RDF) | 11. Emergency Back-up Control Panel |
| 5. VHF-FM Radio Fuses | 12. Station Control Panel (Active/Sync/Low Idle/Override) |
| 6. VHF-FM Radio | 13. VHF-FM Radio |
| 7. Window Heater Fuses | 14. Loudhailer |

Figure 2-12
Enclosed Bridge - Lower Console



- | |
|---|
| 1. Port Window Wiper Switches |
| 2. Port Wiper Speed Potentiometer |
| 3. Port Window Blower Switch |
| 4. Window Washer Switch |
| 5. Window Heater Switches |
| 6. Starboard Window Blower Switch |
| 7. Starboard Window Speed Potentiometer |
| 8. Starboard Window Wiper Switch |

Figure 2-13
Enclosed Bridge - Lower Console (Sub-Unit)



-
- B.13.c. Engine controls** An engine start/stop and throttle control system is mounted on the centerline between the port and starboard helm chairs. Separate emergency engine (manual override) backup panel and controls are mounted directly above the throttles. Emergency air shut down pull cables are mounted on the port and starboard sides of the engine throttle control console. The search light control is mounted aft of the engine throttles. The CO₂ fire fighting system activation handle is located aft and below the engine controls.
-
- B.13.d. Windows** The Enclosed Bridge has 12 windows. The four forward facing windows are heated glass with controls in the lower sub-console. Two opening windows (port and starboard) are abeam of the helm chairs. The windows lock in the open position using a setscrew and slide mechanism. They secure using a screw type dog. Two stationary windows (port and starboard) are aft of the opening windows. Two spring-loaded hinged windows (port and starboard) are aft of the stationary windows. They are controlled by the Emergency Window Release System (EWRS) which automatically releases the windows in the event that the Enclosed Bridge is flooded in a rollover situation to allow free transfer of water. They can also be manually released using the CO₂ pull handle mounted on the overhead directly above the throttle control station. An aft facing window is starboard of the watertight door in Bulkhead 8 and there is a window in the watertight door itself. The side and aft windows, except for the door, are fitted with 12-volt blowers to help control condensation.
-
- B.13.e. Chart table** A chart table is on the port side adjacent to the forward console. In the stowed position, the table fits vertically adjacent to the bulkhead. When in use, the table extends out over the port helm chair. A chart bag with navigation equipment may be hung on the port bulkhead next to the table.
- (See Appendix B: EC-028)
-
- B.13.f. CO₂ system** A CO₂ System Actuator (Nitrogen) Cylinder is mounted on the console directly below the throttles.
-
- B.13.g. HVAC system** A self-contained HVAC unit is located on the overhead above the starboard bolster seat. Heating or cooling is controlled with the HVAC Control Unit mounted on the starboard bulkhead.
- (See Appendix B: EC-028)
-



B.13.h. Bilge pump alarms/controls	The bilge pump alarm panel and controls are to starboard of the aft facing window on Bulkhead 8. Manual, automatic or off may be selected for any pump. The normal mode is automatic. Bilge alarm circuit is connected to the boat horn on the mast platform. A selector switch for moored and underway is located on the panel. (See Appendix B: EC-015)
B.13.i. Navigation lights	Navigation light controls are to port of the watertight door on the aft bulkhead. A rotary switch is available to select anchor light, running lights, towing astern (200 meters or less) and inland alongside towing.
B.13.j. HF Radio	The HF Radio is mounted on the starboard bulkhead at Frame 9.
B.13.k. Binoculars	Binoculars are stowed in a rack on the starboard bulkhead forward of the HF Radio.
B.13.l. Fire extinguishers	A 5-lb CO ₂ is on the port side of Bulkhead 8 next to the navigation light panel. A 10-lb PKP is on the starboard side superstructure just in front of Bulkhead 8.
B.13.m. Battle lantern	A battle lantern is mounted on the starboard outboard side of the overhead just forward of the aft window.



Section C. Open Bridge

C.1. Access

Two locations give access to the Open Bridge. A QAWTD leads from the Enclosed Bridge and a ladder with handrail leads from the aft main deck. A safety line is attached at the top of the handrail.

C.2. Steering Stations

The Open Bridge has port and starboard steering stations.

C.2.a. Port station

The port steering station (**Figure 2-14**) has an electric follow-up jog lever for helm control. The throttle control station is on top of the port console. The rudder angle indicator is to port of the throttles. This unit displays the position of the rudder in one degree increments. A dimmer switch for the tachometers and rudder angle indicator is mounted above the rudder angle indicator. A 1" check ball is located on the underside of the console to allow drainage and to prevent water intrusion in the event of a rollover.

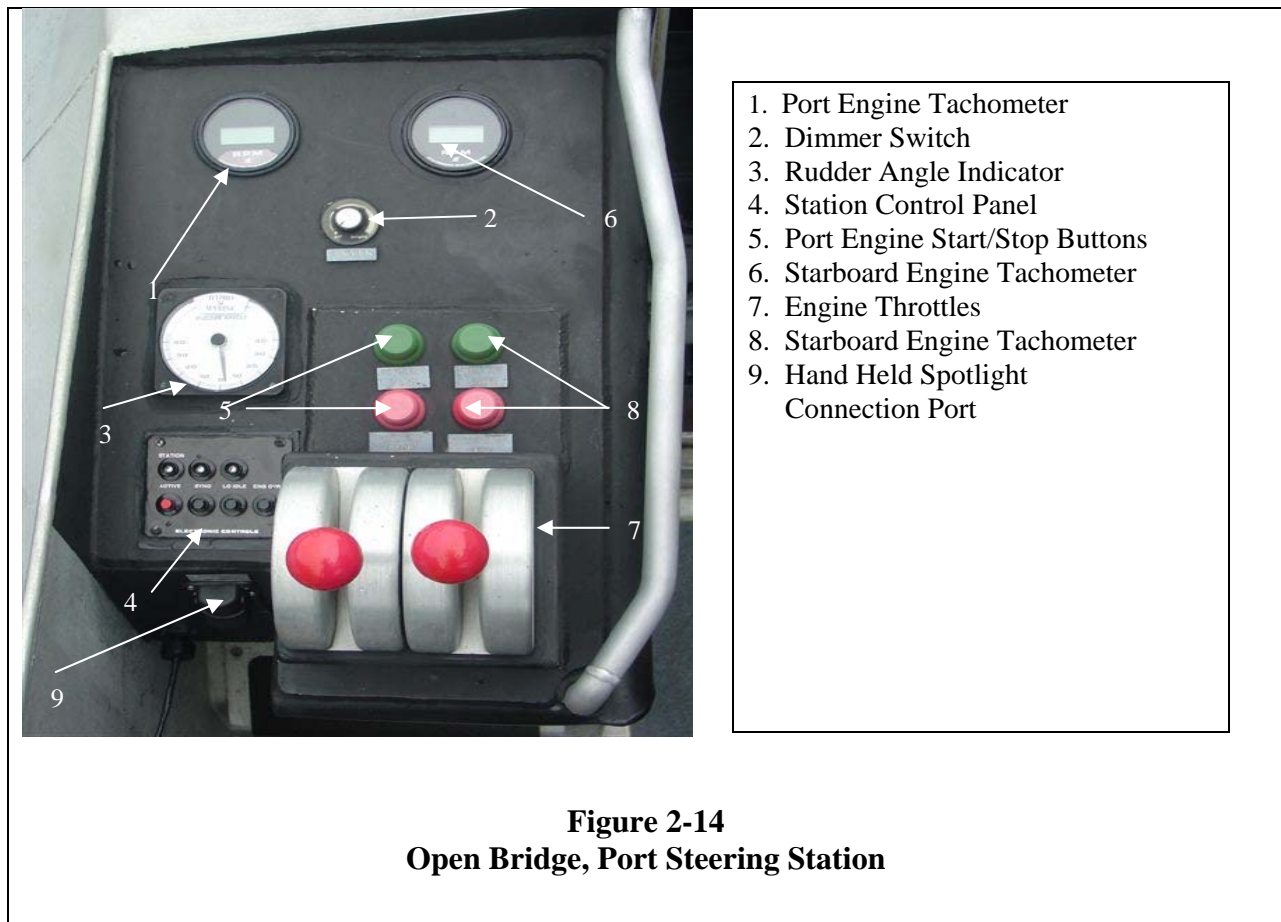
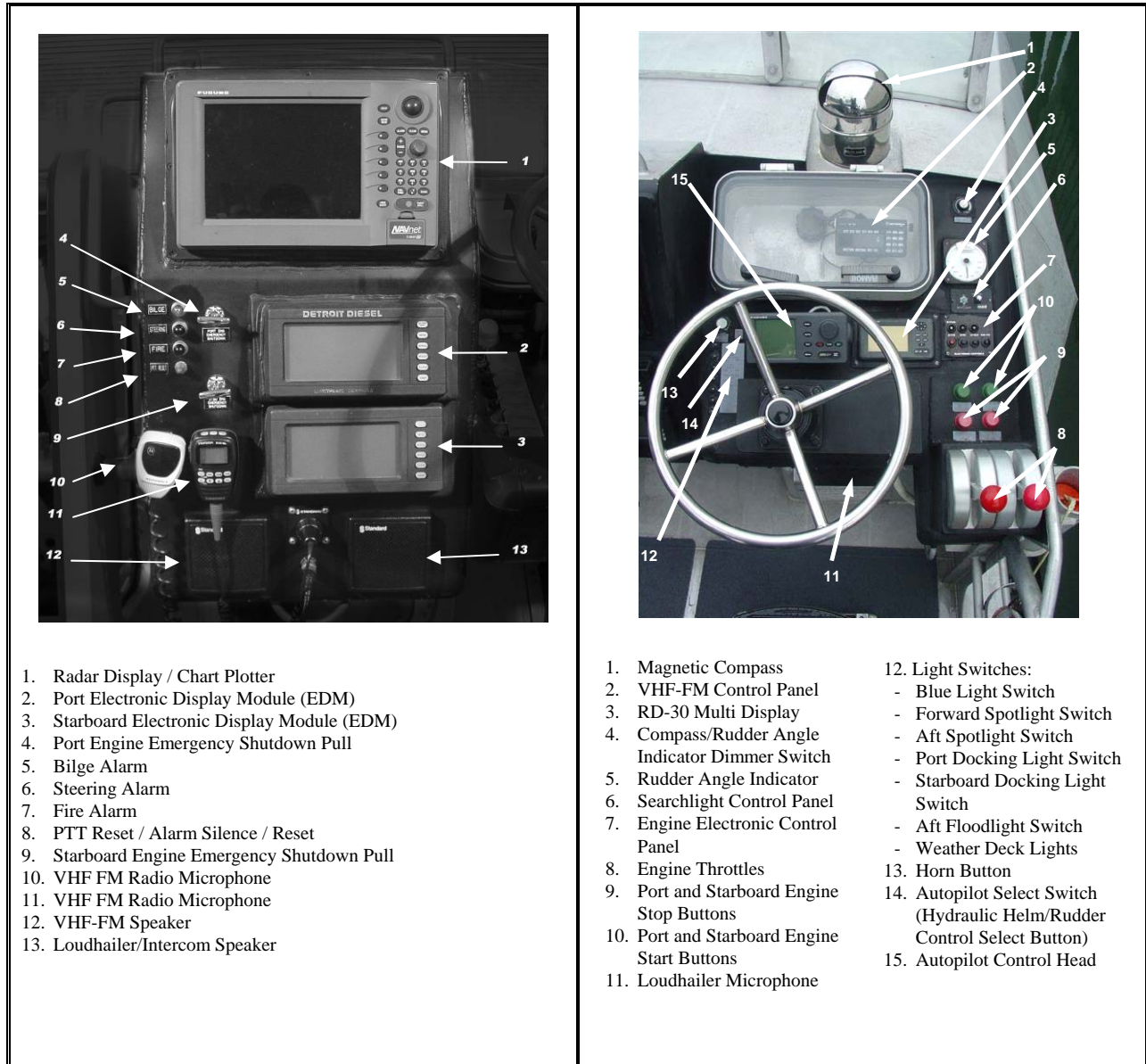


Figure 2-14
Open Bridge, Port Steering Station



C.2.b. Center console The center console (**Figure 2-15**) is to starboard of the centerline. The console contains the DDEC EDMs. Engine air shutdown "T" handles, the engine room fire alarm warning light/silence switch, the bilge alarm indicator and the hydraulic low pressure alarm indicator are to the port of the EDMs. The fathometer (which indicates depth, speed, and temperature) indicator and the heading indicator are to port of the fire alarm controls.

C.2.c. Starboard station The starboard steering station (**Figure 2-16**) has a steering wheel for helm control. Deck light switches and horn button are inboard of the helm unit. The autopilot control unit is directly above the helm unit. The searchlight control panel is located above the helm unit. The dimmer switch controls lighting for the rudder angle indicator and compass light. A 1" check ball is located on the underside of the console to allow drainage and to prevent water intrusion in the event of a rollover.




1. Radar Display / Chart Plotter
2. Port Electronic Display Module (EDM)
3. Starboard Electronic Display Module (EDM)
4. Port Engine Emergency Shutdown Pull
5. Bilge Alarm
6. Steering Alarm
7. Fire Alarm
8. PTT Reset / Alarm Silence / Reset
9. Starboard Engine Emergency Shutdown Pull
10. VHF FM Radio Microphone
11. VHF FM Radio Microphone
12. VHF-FM Speaker
13. Loudhailer/Intercom Speaker

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Magnetic Compass 2. VHF-FM Control Panel 3. RD-30 Multi Display 4. Compass/Rudder Angle Indicator Dimmer Switch 5. Rudder Angle Indicator 6. Searchlight Control Panel 7. Engine Electronic Control Panel 8. Engine Throttles 9. Port and Starboard Engine Stop Buttons 10. Port and Starboard Engine Start Buttons 11. Loudhailer Microphone | <ol style="list-style-type: none"> 12. Light Switches: <ul style="list-style-type: none"> - Blue Light Switch - Forward Spotlight Switch - Aft Spotlight Switch - Port Docking Light Switch - Starboard Docking Light Switch - Aft Floodlight Switch - Weather Deck Lights 13. Horn Button 14. Autopilot Select Switch (Hydraulic Helm/Rudder Control Select Button) 15. Autopilot Control Head |
|--|---|

Figure 2-15
Open Bridge, Center Console

Figure 2-16
Open Bridge, Starboard Steering Station



-
- C.3. Radar** The radar is flush mounted below the center console.
(See Appendix B: EC-016)
-
- C.4. Windscreen** A clear lexan windscreen extends across the superstructure in front of the consoles.
-
- C.5. Magnetic Compass** A magnetic compass is between the windscreen and the starboard steering station and acts as a back up to the electronic heading indicator.
-
- C.6. Seating** There is seating for four crew members: a helm chair in front of each steering station and two jump seats behind the port helm chair. All seating has integral safety belts.
(See Appendix B: EC-005 and EC-013)
-
- C.6.a. Helm chairs The helm chairs have multiple adjustments for up and down, fore and aft, and can rotate 360 degrees with locking positions each 90 degrees. A positive vertical locking pin ensures no up and down movement during underway operations. Chairs may be painted (prior to EC-033) or sand blasted to bare aluminum, not polished.
(See Appendix B: EC-013, 030, 033)
-
- C.6.b. Jump seats The jump seats can be lowered into a vertical position when not in use to provide more deck space. The jump seats may be painted or sand blasted to bare aluminum, not polished.
-
- WARNING**  When raising the crew member jump seats into position for use, ensure that the seat bottom drops completely into the locking groove to prevent the seat from collapsing during underway operations. Insert pin in accordance with EC-013 to lock in place.
(See Appendix B: EC-013)
-
- C.7. Binoculars** Binoculars are stowed in a rack under the starboard steering station console.
-
- C.8. “D” Rings** “D” rings are at various locations around the handrails and forward face of the consoles for use with safety belts in heavy weather operations.
(See Appendix B: EC-004 and Amendment 1)
-



Section D. Mast Platform

D.1. General

The mast platform (Figure 2-17) is a buoyancy chamber that aids in re-righting the boat in the event of capsizing. The radar antenna, DGPS antenna, blue light, forward and aft fixed spot lights, and aft deck working lights are all on top of the mast platform. The mast tower is mounted amidships aft on the mast platform. The mast tower can be lowered for maintenance or low clearances by using a block and tackle rig attached to the tow bit. The anchor light, upper and lower masthead light, upper and lower aft facing towing lights, and the stern light are mounted on the mast. The VHF-DF antenna and a remote-controlled spotlight are also on the mast tower.

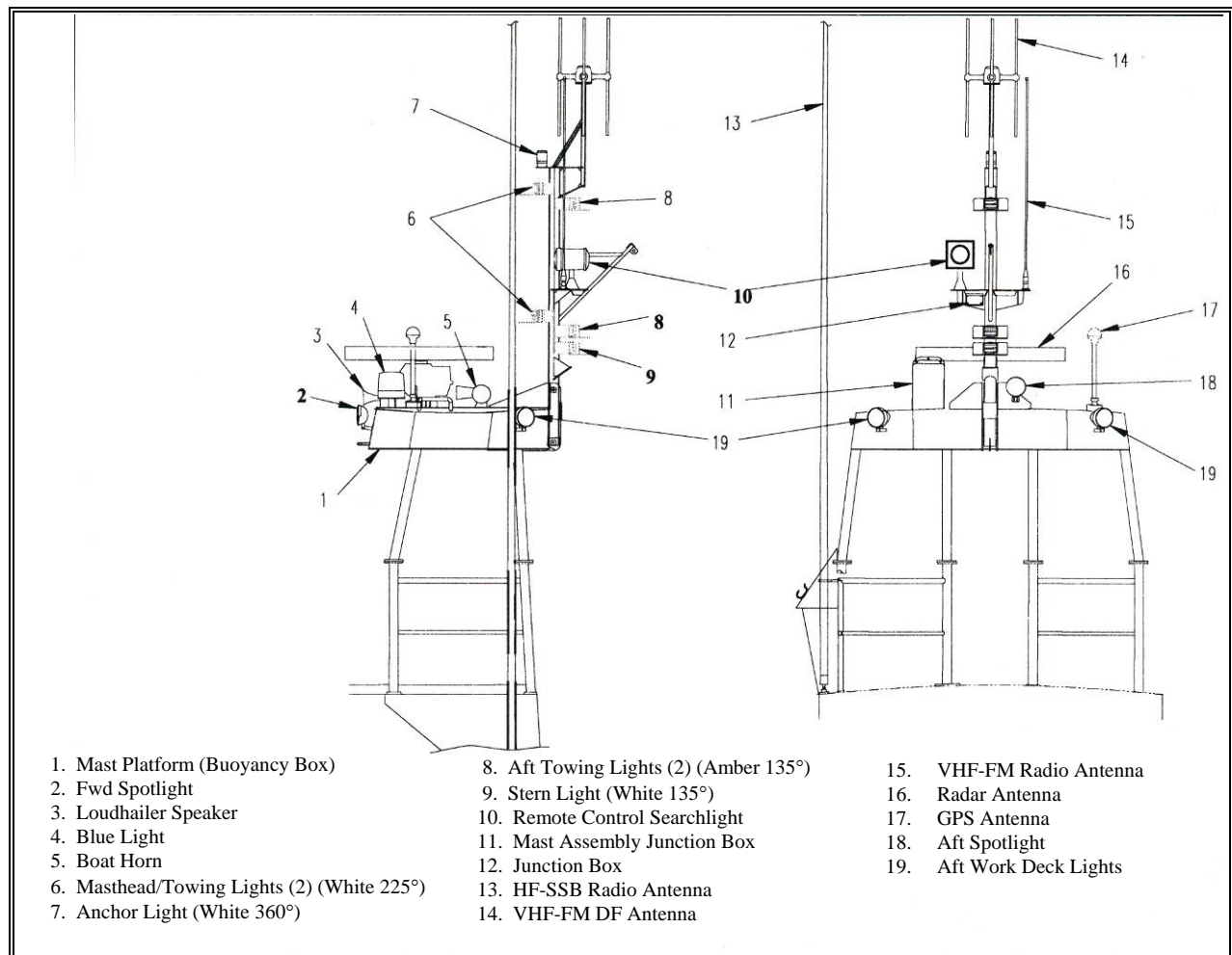


Figure 2-17
Mast Platform



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Section E. Main Deck Equipment

- E.1. Bullnose** A hinged bullnose with locking pin and lanyard is located on the centerline at the bow. The inside of the bullnose shall be polished to prevent chafing.
-
- E.2. Paired Bitts** The bitts are located on both port and starboard from forward to aft between Frames 16 and 17, at Frame 12, between Frames 8 and 9, and between Frames 2 and 3. The bitts, with the exception of the tops, shall be polished to prevent chafing.
-
- E.3. Chocks** Chocks are located on both port and starboard sides at Frame 14, between Frames 9 and 10, between Frames 3 and 4, and between Frames 1 and 2. The inside of the chocks shall be polished to prevent chafing.
-
- E.4. Handrails** Two handrails, leading fore and aft, are mounted on the foredeck. Handrails on the sides of the superstructure start between Frames 10 and 11 and end between Frames 3 and 4. An additional handrail runs transversely across the forward foredeck at Frame 11. The aft buoyancy chamber encloses the aft deck. The taffrail runs across the transom to Frame 3 (p/s) and shall be polished to the upper "D" ring on port and starboard sides. "D" rings are at various locations around the handrails.
-
- E.5. Tow Bitt** The tow bitt is just aft of Frame 2 centered over the keel between the engine room removal covers on the aft deck. The tow bitt is 30" high and the working surface shall be polished to prevent chafing. Tow post stiffeners run aft from the post and attach to the deck at the intersection of Bulkhead 1. A stanchion in the engine room strengthens the deck.
-
- E.6. Tow Reels** Two tow reels are recessed on the port aft corner of the superstructure. The upper reel carries 300' of 2¼" DBN line. The lower electrically powered reel carries 900' of 3¼" DBN line. An electric motor is mounted internally in the lower reel only. The control switch is above the upper reel. A breaker switch and power reset button are located inside the aft Survivors compartment door. A hand crank is secured to the port side of the tow line reels. It can be used on either reel.
-



E.7. Deck Lighting

The superstructure has eight deck lights that illuminate the deck. There is one light forward just above the deck, superstructure lights (port and starboard) at Frame 9 and Frame 4 just above the deck, and in the recesses between Frames 6 and 7. The controls for the deck lights are on the starboard Open Bridge. Covers shall be either painted or sand blasted to bare metal, not polished.

E.8. Miscellaneous Equipment

An HF-FM antenna is on the port side of the superstructure at Frame 4. It can be lowered for maintenance and low clearances. Port and starboard running lights are on top of the Enclosed Bridge Steering Station overhead between Frames 9 and 10. Thirty-inch ring buoys are mounted port and starboard at Frame 6 on the sides of the Open Bridge handrails. The floating electric marker lights are just forward of the ring buoys. Rescue line throw bags are mounted on the Open Bridge handrails. A diver's knife is mounted on the port stanchion of the ladder from the Open Bridge to the aft deck. Eight-foot telescopic aluminum boat hooks with hull numbers and skiff hook attachments are mounted on both port and starboard sides of the superstructure.

(See Appendix B: EC-019, EC-004 and Amendment 1)



Section F. Main Deck Stowage

F.1. Aft Buoyancy Chamber

A buoyancy chamber at the stern of the boat is 30" high from the main deck to the top of the taffrail. A recess on the starboard side houses the CG-P6 dewatering pump can. The aft buoyancy chamber is divided into three watertight deck boxes. Each box has a QAWTH on the forward face with a single dogging handle. Two suction standpipes for the CG-P6 dewatering pump are on the forward face of the starboard hatch on either side. The outboard standpipe is used for raw water suction when fire fighting or for cooling of the deck. The inboard standpipe is used for engine room dewatering.

F.1.a Port aft deck box

The port aft deck box contains 200' of 2¼" DBN drogue/grapnel line, two drogues (small/large), one roll of marlin, two heaving lines, and chafing gear/assorted shackles as required.

F.1.b. Center aft deck box

The center aft deck box contains a DBN bridle (sized as required), wire/kevlar bridle as required, block and tackle for mast lowering, skiff hook with pendent, and a #4 grapnel hook.

F.1.c. Starboard deck box

The starboard deck box contains one 6' by 3" suction hose with sized camlock fitting attached for connecting the CG-P6 dewatering pump to each standpipe, and one 50' discharge hose with a fire fighting nozzle.

F.2. Forward Deck Lockers

A deck locker is on each side of the forward superstructure between Frames 10 and 11. A QAWTH with two dogging handles seals the locker. The hatch can be locked in the open position using a quick release pin secured with lanyard on the forward hinge.

F.2.a. Port deck locker

The port deck locker contains a 19-lb Fortress anchor (Danforth type) mounted in a bracket. Attached to the anchor is a 2-lb mud fluke. A reel adjacent to the anchor houses 300' of 2¼" DBN anchor line. Nine feet of 3/8" stainless steel chain is attached to the anchor and anchor line using 3/8" stainless steel shackles and swivel moused as ground tackle. Small stuff should be used to secure the chain to the reel to prevent it from vibrating loose in the space. A T-handle for opening the Forward Compartment watertight scuttle is also located in the locker in a bracket.



F.2.b. Starboard deck locker The starboard deck locker contains fenders and alongside lines as required. A minimum of eight alongside lines and four fenders are required. It also contains the window washer fluid tank.

NOTE 

Fenders may be stowed in the port and starboard deck lockers.

F.3. Pump

The boat is outfitted with one CG-P6 dewatering pump capable of limited fire fighting and dewatering. The CG-P6 is stowed in a pump can on the starboard side of the aft buoyancy chamber. A 3” suction hose is connected to the pump and the raw water standpipe. The fire hose with vari-nozzle may be attached to the pump discharge.

WARNING 

The CG-P6 fire fighting capability is intended to only provide personnel protection or to aid in removing survivors from a burning platform.



CHAPTER 3 BOAT SYSTEMS

Introduction This chapter discusses the boat's mechanical, electrical, and manual operating systems. It describes basic characteristics and provides information to allow the boat's crew to operate effectively.

In this Chapter This chapter contains the following sections:

Section	Topic	See Page
A	Propulsion System	3-3
B	DDEC System	3-7
C	Raw Water Cooling System	3-11
D	Engine Systems	3-13
E	Fuel Oil System	3-22
F	Hydraulic Steering System	3-25
G	Heating, Ventilation, Air Conditioning System (HVAC)	3-27
H	Electrical System	3-29
I	Emergency Systems	3-37
J	Communication/Navigation Systems	3-47
K	Weapons Mounting	3-57



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Section A. Propulsion System

Introduction

The major components of the propulsion system (**Figure 3-1**) are the two main engines mounted in the engine room, the Cardan shafts that pass through Bulkhead 5 and couple the engines to the reduction gears, the two reduction gears configured for “U” drive mounted in the Survivors compartment, and the propellers and shafts.

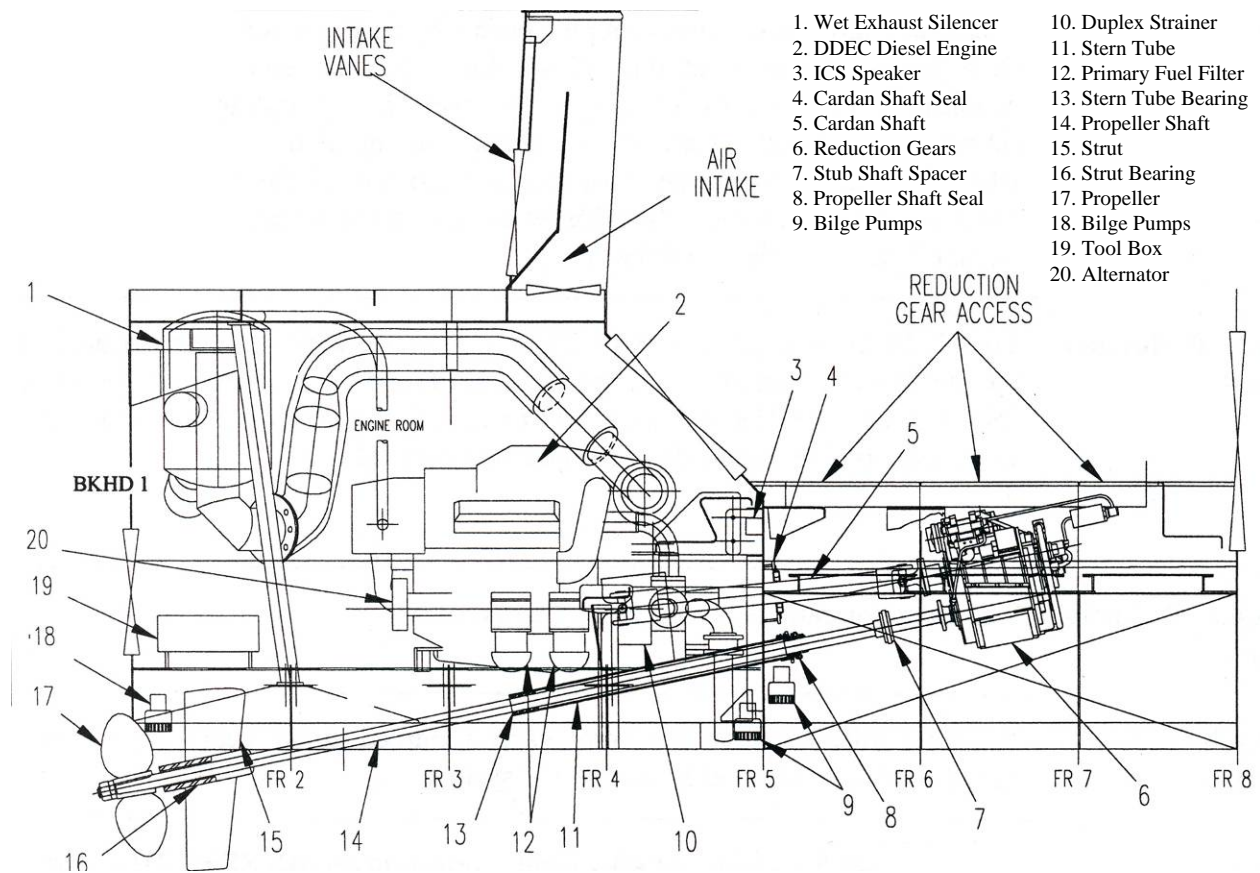


Figure 3-1
Propulsion System (Engine Room & Survivors Compartment)



A.1. Engines

The 47FT MLB is equipped with two Detroit Diesel Electronically-Controlled (DDEC) 6-cylinder, 2-stroke, turbo-charged, after-cooled marine diesel engines to DDEC 6V92TA. The engine rating is 435 horsepower at 2100 RPM. The engines are separate port and starboard versions; each is right-hand rotating as viewed looking aft from the front of the engine. Coolant capacity is 12 gallons and lubricating oil capacity is 5.5 gallons of 40-weight 2104D. A computer controls all engine combustion functions; it maintains constant engine RPM under variable loads and limits maximum and minimum RPM.

A.2. Drive Shafts

A Cardan shaft (drive shaft) couples each engine to its reduction gear. The shaft has a spline joint that allows for expansion and contraction. A Vulcan coupling is mounted to the engine flywheel. This coupling is made of a rubber material and accepts the torsional twist applied to the Cardan shaft when the engine accelerates. U-joints at each end of the shaft accept any misalignment. The Cardan shaft passes through a water restrictive rubber seal clamped on each side of Bulkhead 5.

A.3. Reduction Gears

The 47FT MLB uses Reintjes WVS 234 UP Marine Reduction gears located in the Survivors compartment to port and starboard of the fuel tank between Frames 6 and 7 (**Figure 3-2**). The gear is a “U” drive unit where the output and input flanges are on the same side of the gear and parallel.

A.3.a. Reduction ratio

The reduction ratio is 2:1 in forward and reverse.

A.3.b. Control valve

An electronically actuated control valve mounted at the gear box controls gear function as affected by the DDEC system.

A.3.c. Lubricating oil

The gear uses 7.1 gallons of 30-weight lubricating oil (MILSPEC 2104D or E) for clutch-apply pressure and lubrication.

(See Appendix B: EC-020)

A.3.d. Temperature

A temperature regulating valve and gear oil cooler maintain oil temperatures between 140-176°F.

A.3.e. Cooler

The cooler is supplied with raw water from the engine raw water system.



A.3.f. Clutch-apply pressure

Normal disengaged pressure is 58 to 66 PSI and normal clutch-applied pressure is 230 to 290 PSI. If apply pressure is lost, the gear is fitted with a come-home device. It is engaged by mechanically locking the clutch together with set screws. In the event of electronic control failure, the control valve can be operated manually.

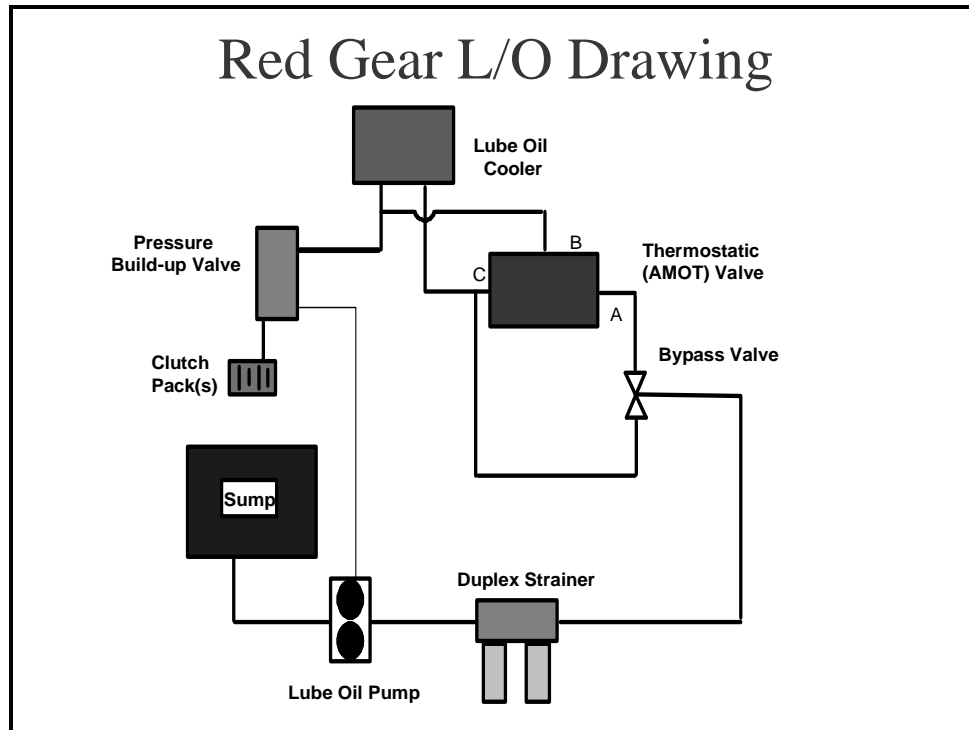


Figure 3-2
Reduction Gear Lube Oil Drawing



A.4. Propeller Shafts

Each propeller shaft is 2½" inches in diameter and constructed of CRES AQUAMET 22. The reduction gear end is fitted with a flange that is secured to the shaft using one center bolt and lock wire (.0625) preventing the bolt from backing out. A stub shaft connects to the reduction gear output flange and is secured with ½" bolts. A Micarta shaft isolator is between the stub shaft and the prop shaft to protect the gear in the event of grounding and electrolysis.

(See Appendix B: EC-007)

The prop shaft runs aft from the gear in a stern tube starting at Bulkhead 5 and penetrates the hull between Frames 3 and 4 in the engine room. A PSS drip-less shaft seal encompasses the shaft. The shaft is supported aft by a stainless steel strut with a strut extension to protect the propeller.

(See Appendix B: EC-017)

A.4.1. Spur line cutters

There are Spur line cutters installed between the strut and prop on each shaft facing inboard. A 4-bladed, 28" diameter x 36" pitch propeller is at the end of each propeller shaft.

(See Appendix B: EC-021)



Section B. DDEC System

Introduction

DDEC is a computerized electronic engine control, governing and fuel injection system that replaces mechanical controls in a Detroit Diesel engine. It interfaces with the boat's installed reduction gear and control systems to provide a complete control package that maximizes the efficiency and performance of the boat's propulsion system. DDEC also automatically performs engine protection and self-diagnostic functions to identify malfunctions in its components and provides data to the engineer to aid in troubleshooting engine problems.

B.1. Major Components

There are seven major components of the DDEC System (**Figure 3-3**):

B.1.a. Electronic Control Modules (ECMs)

There are two ECMs; they are mounted directly on each engine. Each ECM contains the microprocessor that continuously monitors and controls engine performance and calibration. The ECM receives input from sensors located on the engine that tell it operating information such as turbo boost, timing, oil and fuel temperature/pressure and coolant level/temperature. The ECM sorts this information and provides direction to the electronic fuel injection system to attain the desired performance. Each ECM also contains a back-up microprocessor which operates the engine should the main processor malfunction. The ECMs perform the following functions:

- Engine governing.
- Cold start fueling and timing.
- Engine protection and diagnostics.
- Injection timing.
- Rated speed and power.
- Sensor calibrations.
- Smoke control.

CAUTION!

The DDEC electronic control system is very sensitive to current/voltage fluctuations and surges. Disconnect required components before conducting any welding on the 47FT MLB in accordance with PMS Manual.



B.1.b. Electronic Unit Injectors (EUI) The EUI replace the traditional fuel injectors with an electronically controlled solenoid valve and straight plunger on each injector.

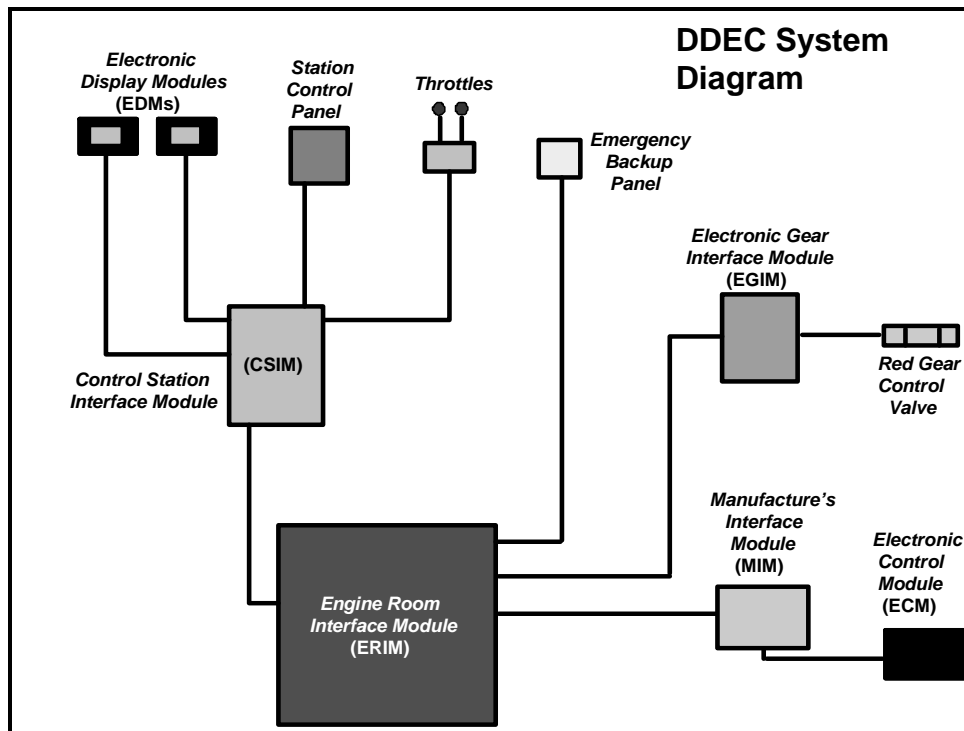


Figure 3-3
DDEC System Diagram

B.1.c. Manufacturers / Marine Interface Modules (MIMs) MIMs mounted on both engines provide the interface between the boat's control systems and the ECM. In addition, the MIM features a diagnostic connector port which allows the engineer or service personnel to connect the DDEC diagnostic reader to the engine for troubleshooting.

B.1.d. Engine Room Interface Module (ERIM) The ERIM is located in the Auxiliary Machinery Compartment. It is the central processor of the control systems (throttles) on the boat. It accepts signals from the three control stations on the boat and commands the engines (through the MIMs and ECMs) to operate at the proper speed. It also directs the clutch actuators to control direction of propulsion.



B.1.e. Control station interface modules (CSIMs) There are three CSIMs on the 47FT MLB. All three are located in the Enclosed Bridge; two in the overhead for the Open Bridge throttles and one in the main console, port side under lower kick plate. The CSIM receives signals from the throttles and the throttle control buttons. It sends this information encoded into command signals to the ERIM.

B.1.f. Electronic Display Modules (EDMs) The EDMs are the LCD displays mounted in the Enclosed Bridge and the Open Bridge. There is one EDM for each engine at each location. They receive information via a connection to the CSIM and display engine RPMs and vital performance data such as oil pressure, engine temperature, transmission oil pressure and temperature, instantaneous fuel consumption and total engine hours.

B.1.g. Electronic Gear Interface Modules (EGIMs) The EGIMs are located in the Auxiliary Machinery Compartment underneath the ERIM. They take electronic signals from the ERIM and actuate the reduction gear clutches.



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Section C. Raw Water Cooling System

Introduction

There are two separate raw water systems on the 47FT MLB. The primary system provides cooling for various elements of the propulsion system. A separate raw water system serves the boat's HVAC system; this secondary system is discussed in the HVAC system section of this chapter. The primary raw water system (**Figure 3-4**) carries out five functions:

Maintains fuel oil temperatures below 90°F.

Removes heat from engine coolant to maintain proper operating temperatures.

Removes heat from reduction gear lube oil to maintain proper operating temperatures.

Removes heat from the steering system hydraulic oil to maintain proper operating temperatures.

Provides cooling and quieting for engine exhaust.

C.1. System Flow

Each raw water valve is located on the opposite side of the keel of the engine that it services between Frames 4 and 5 below the engine room ladder.

Step	Action
1	The raw water flows through a 4" duplex strainer on the port and starboard inboard girders between Frames 4 and 5.
2	From the sea strainer, water flows to the raw water pump that has a flow rating of 67 GPM.
3	From the raw water pump, water flows through the fuel cooler and maintains fuel temperature below 90°F.
4	From the fuel cooler, water is piped to the engine heat exchanger where it cools the engine coolant.
5	On the outboard side of each engine, the flow is divided. One direction leads forward through Bulkhead 5 to the reduction gear oil cooler and the shaft seal for sealing and cooling. The second flow is restricted through a 1" restrictor plate and goes to the water-cooled muffler. On the starboard side, a separate branch provides cooling for the steering system hydraulic fluid.



Step	Action
6	After passing through the reduction gear oil cooler, the flow re-enters the engine room and branches off. One leg goes to the de-icing valve, while the other discharges overboard through the water-cooled muffler.
7	In the water-cooled muffler, raw water cools and quiets the exhaust and is discharged over the side via the exhaust ports. The mufflers are cross-connected to prevent back pressure if one exhaust port is submerged. An isolation valve is installed in the cross-connect to prevent internal condensation in the event of single engine operation. (See Appendix B: EC-027)

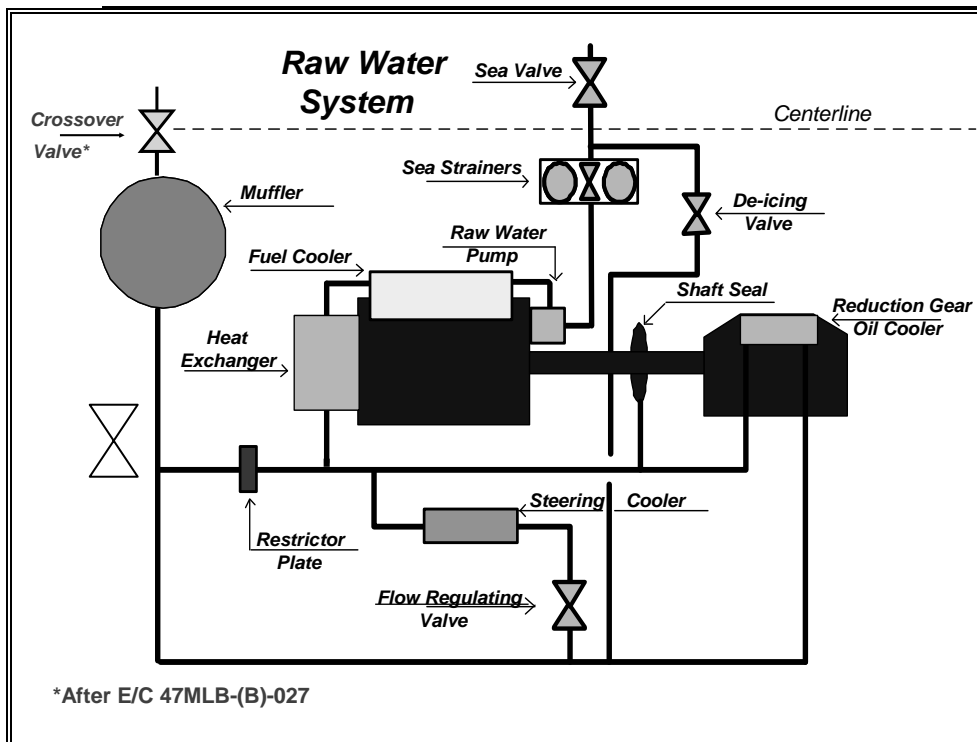


Figure 3-4
Raw Water System



Section D. Engine Systems

Introduction Operating and supervisory commands and boat crews will comply with the procedures and limitations specified in this publication and any duly issued changes.

In this Section This section contains the following information.

Topic	See Page
Engine Coolant System	3-14
Engine Lubrication System	3-16
Engine Combustion Air System	3-19
Engine Exhaust System	3-21



Engine Coolant System

Introduction The Detroit Diesel 6V92TA has a 10-12 gallon capacity closed-circuit cooling system. It is comprised of a 50/50 mixture of Power Cool and distilled water.

D.1. Block Flow The heat exchanger is a reservoir for coolant and housing for the raw water heat exchanger.

Step	Action
1	The coolant passes across the heat exchanger, giving up its heat to the raw water.
2	The coolant is then drawn into the pump.
3	The pump has two outlets: One flows to the right bank thermostat housing and the other directly to the after-cooler. From the right bank thermostat housing, it flows to the lubricating oil cooler where it maintains the lubricating oil at 200° to 250°F. Water can bypass the cooler and go directly into the block depending on the temperature of the oil as regulated by a thermostatic valve.
4	From the lubricating oil cooler, coolant flows into the block absorbing the heat from combustion around the cylinder liners.
5	Coolant then flows up from the block into the heads where the fire deck is cooled.
6	The main flow of coolant joins the after-cooler discharge and enters the left bank thermostat housing where a thermostatic valve is housed.
7	The 170°F thermostat regulates the temperature of the coolant flowing through the block by opening or closing the discharge passage to the heat exchanger.
8	When the engine is warming up, the thermostat will close the passage to the top of the heat exchanger and open the passage directly to the suction side of the pump.
9	The heat exchanger is now taken out of the flow path.

**D.2. Charge
Air Flow**

The combustion charge air cooling flow is another component of the engine coolant system.

Step	Action
1	Coolant flows from one discharge side of the pump to the after-cooler mounted in the engine air box below the blower.
2	Charged air from the blower and turbocharger passes across the after-cooler, which reduces air temperature to 100°F, depending on cleanliness. Cold air is denser and will hold more oxygen for combustion.
3	From the after-cooler, the flow is piped to the left bank thermostat housing and joins the flow from the block.



Engine Lubrication System

Introduction

The Detroit Diesel 6V92TA has a closed-circuit, pressurized lubrication system with a capacity of 5.5 gallons, including filter and lines, of 40-weight lubricating oil. The normal operating range is 49-70 PSI.

D.3. Scavenging Oil Pump

A scavenging-type oil pump is mounted on the two forward main bearing caps and is driven by the gear train from the forward end of the crankshaft. The scavenging oil pump is actually two pumps in a single casing.

D.4. How the Pump Works

The following is how the pump circulates oil through the engine (**Figure 3-5**):

Step	Action
1	The aft or scavenging pump moves oil from the back of the oil pan to the front of the oil pan over a baffle.
2	The front or main oil pump takes suction from the front of the oil pan through the intake screen and pipe, then into the pump where it is pressurized.
3	The oil then goes from the pump to a short gallery in the cylinder block to the oil cooler adapter plate and to a spring-loaded pressure relief valve mounted on the cylinder block.
4	This valve discharges excess oil to the oil pan when the pressure exceeds 105 PSI.

D.5. Flow

The oil flows from the oil cooler adapter plate to the full-flow oil filter (30 micron). Then it flows through the oil cooler and then back into the cylinder block. Here, a short vertical oil gallery and a short diagonal oil gallery carry the oil to the main longitudinal oil gallery through the middle of the block.

Valves are also provided to bypass the oil filter and oil cooler if either becomes plugged.



D.6. Pressure Regulator Valve A pressure regulator valve located at the end of a vertical oil gallery stabilizes lubricating oil pressure at all speeds regardless of the oil temperature.

The regulator valve opens when the oil pressure at the valve exceeds 62 PSI and discharges oil back to the oil pan.

D.7. Vertical Gallery The vertical gallery is located at the front of the cylinder block on the side opposite the oil cooler.

D.8. Main Gallery The following steps describe the flow of oil through the main gallery:

Step	Action
1	The pressurized oil flows from the main oil gallery through drilled passages to each main bearing.
2	The oil then passes to an adjacent pair of connecting rods through grooves in the upper main bearing, lower connecting rod bearing and drilled passages in the crankshaft.
3	The rifle-drilled connecting rods carry oil from the connecting rod bearings to the piston pin bushing.

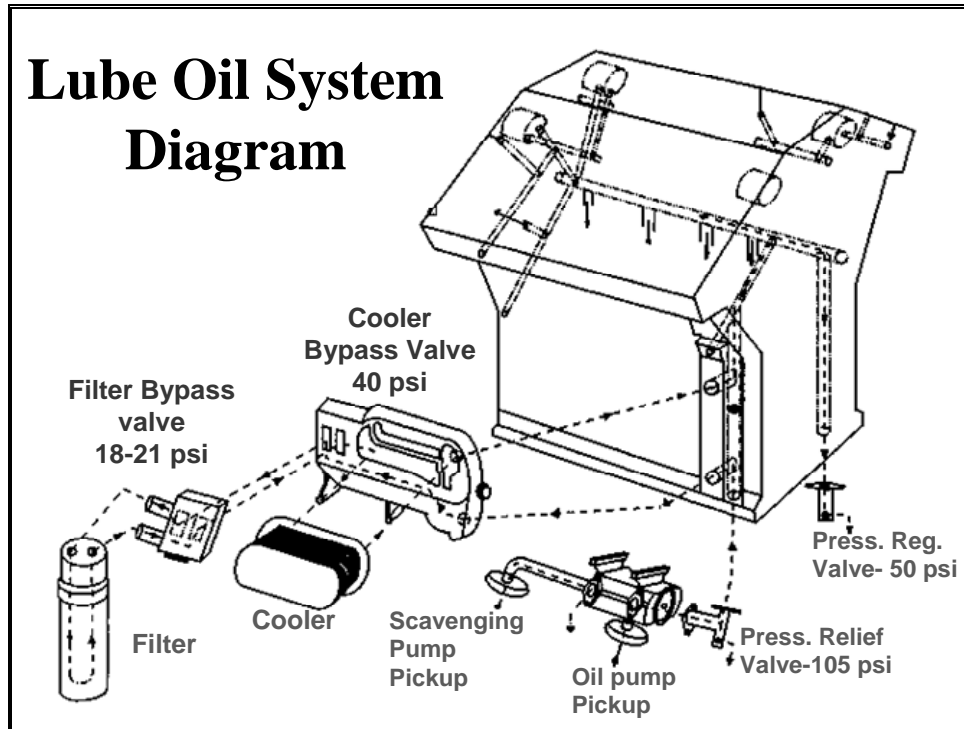


Figure 3-5
Lube Oil System



Engine Combustion Air System

Introduction

The engines are two-stroke marine diesels. For every two strokes of the crankshaft, or one complete up and down cycle of a piston, a combustion cycle takes place. For complete combustion, air must be introduced into the combustion space in the proper ratio. The air flow that pushes exhaust gases through the combustion chambers is called “scavenging air.”

D.9. Blower

Air is forced into the engine by an air pump called a blower. The blower is engine driven through the gear train and supplies pressurized air to a reservoir in the engine block called an air box.

D.10. Turbocharger

The blower itself is not capable of moving enough air to burn the amount of fuel necessary to produce 435 horsepower. To provide the air, the air intake system uses a turbocharger. A turbocharger is an air pump driven by the expelled combustion gases (exhaust) from the cylinders.

Step	Action
1	The exhaust gases expand, entering the lower pressure of the exhaust manifold.
2	The exhaust gases travel through the turbine side of the turbocharger, mounted on the exhaust manifold, to escape to the atmosphere.
3	The exhaust gases expand and pass across the turbine, driving it at an RPM corresponding to the rate of expansion.

D.11. Air Flow

The turbocharger turbine is connected by a shaft to a compressor wheel. The following describes the process of the air flow (**Figure 3-6**):

Step	Action
1	As the compressor wheel spins, it draws air into the compressor housing.
2	The air is pressurized and discharged to the air inlet piping.
3	The piping carries the air to the inlet side of the blower.



Step	Action
4	Since the blower is only capable of generating about 5 PSI and the turbocharger is capable of 20 PSI or more, the blower becomes a restriction. To compensate for this restriction, air flow valves are installed in the blower housing that open an air flow path around the blower compressor lobes. These valves are called oval blower bypass valves.
5	The pressurized air is now carried around the blower and enters the after-cooler. The after-cooler is a heat exchanger that removes heat from the pressurized charged air.
6	As engine coolant cools the charged air, it removes about 100°F. Cooler air is denser and can hold more oxygen for combustion.
7	Air then flows from the after-cooler to the air box for delivery to the combustion chamber.

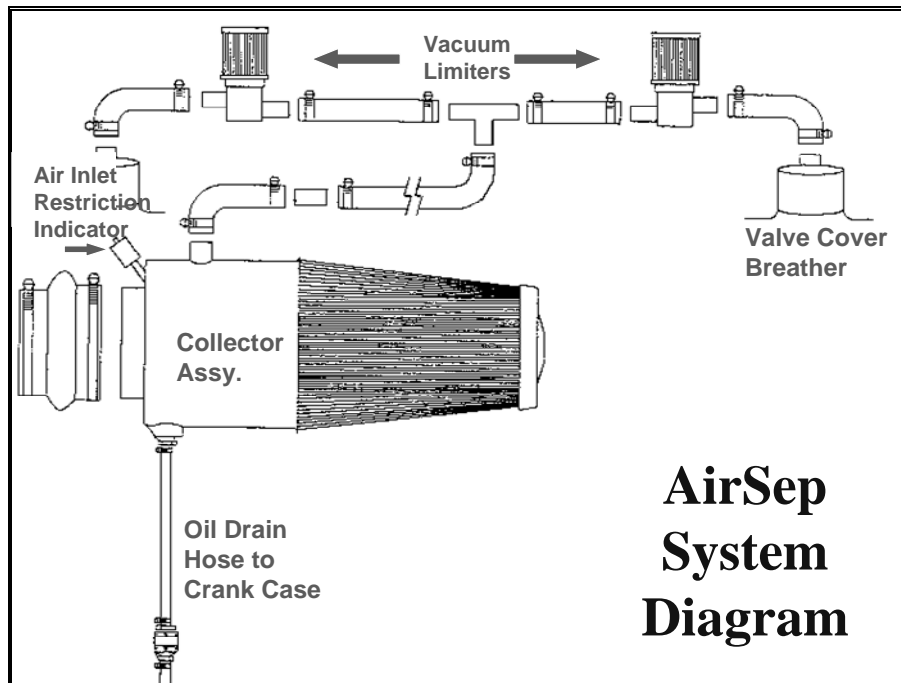


Figure 3-6
AirSep System Diagram



Engine Exhaust System

Introduction

The engine exhaust system (**Figure 3-7**) is divided into port and starboard subsystems with a crossover system needed for rollovers. The crossover is also fitted with an isolation valve. Each subsystem consists of a riser assembly attached directly to the engine's turbo charger outlet adapter.

(See Appendix B: EC-027)

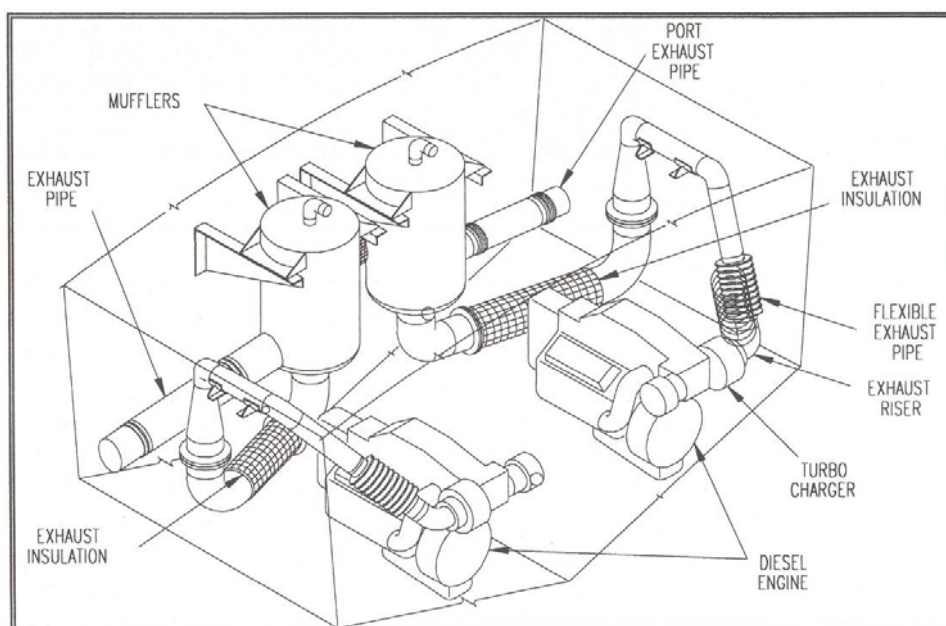


Figure 3-7
Exhaust System

D.12. Exhaust Gas Silencer

Twin wet exhaust lines are located aft between Frames 1 and 2. The exhaust piping angles upwards and enters the mufflers. Through the exhaust gas muffler, gases percolate upwards through the center of the water chamber (supplied by the raw water system). Exhaust gas and overflow from the water tank flow out through a pipe leading outboard from the tank through hull fittings on both port and starboard sides. A cross-connect pipe between the two exhaust mufflers reduces back pressure when one exhaust port is submerged. The exhaust mufflers retain water in the event of a rollover to prevent back drainage into the engines.



Section E. Fuel Oil System

Introduction

The fuel oil system (**Figure 3-8**) is made of three subsystems. When troubleshooting, it is important to consider these subsystems separately and understand how they interact.

E.1. Fuel Tank

The fuel oil tank capacity at 100% full is 394 gallons (373 gallons at 95%). Suction is drawn at a point 2" from the bottom of the tank at Frame 6. The fuel pickup has a bonnet to provide suction in the event that the boat capsizes. Baffles are installed at Frames 6 and 7 to control free surface effect.

E.2. Fuel Oil Supply

Fuel oil circulates through the system as follows:

Step	Action
1	Fuel flows from the tank through the emergency fuel oil cut out valves. These valves are spring-loaded and are actuated by pull cables from the starboard side of the engine room door in the Survivors compartment.
2	Fuel flows through the fuel filter service valve into the primary fuel oil separator. The fuel oil separator is a spin-on type filter (P/N 3201 PUL) with 30 micron rating. It is considered a duplex filter in that it removes particulates and separates water. A removable metal bowl at the bottom of the filter is used for draining water and sediment. (See Appendix B: EC-003, 008, 011, 035)
3	Fuel travels from the primary filter into the fuel oil pump. The fuel pump is gear-driven off the front of the blower. The pump has an internal relief valve that opens at 62 PSI to protect the pump from over pressurization. The pump is also outfitted with a return check valve to prevent seal failure in the event the engine is counter rotated. (See Appendix B: EC-003)
4	Fuel flows from the pump under pressure through the ECM cooler to the secondary 2-4 micron filter.
5	The flow splits to the fuel injection system in each cylinder head.



E.3. Fuel Oil Return

The following steps describe how the fuel oil returns:

Step	Action
1	Fuel oil travels through the cylinder heads for injecting, cooling the fire deck, cleaning and lubricating the fuel injectors. 80% of the fuel flow returns back to the tank.
2	From the heads, the fuel flow enters a manifold where the split flow is brought back together and flows through the fuel cooler. Fuel cools below 90°F to prevent a loss of power due to heat buildup.
3	On the output side of the fuel cooler there is a 0.080" restricted orifice. The orifice provides constant back pressure on the system.
4	The flow continues into the ECM cooling plate and through a check valve. Fuel flow then joins the returned fuel from the other engine, where it passes through a common return check valve just aft of Bulkhead 5 and back to the tank.

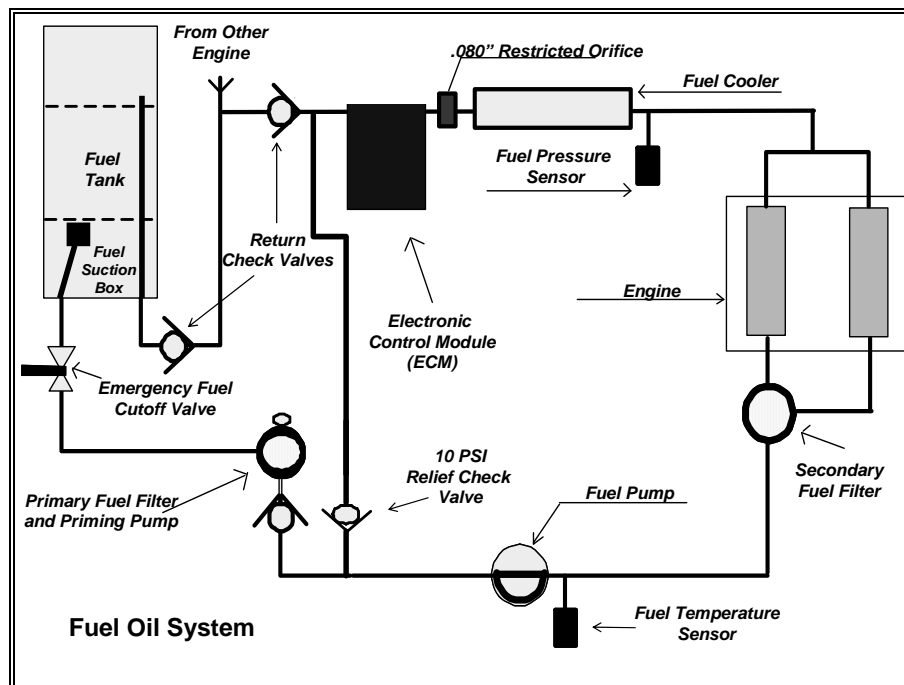


Figure 3-8
Fuel Oil System



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Section F. Hydraulic Steering System

Introduction

The 47FT MLB uses a Manual Servo Steering System that interacts with a power assist system. The steering system (**Figure 3-9**) uses 2 gallons of Tellus T-15 hydraulic fluid. The manual system serves as the boat's emergency steering. If the manual system fails, the boat can be steered using the engines. Though interconnected, for ease of understanding, the systems will be discussed individually.

MANUAL + POWER ASSISTED

F.1. Manual System Operation

A helm unit (axial piston pump) on the open starboard steering station displaces 2.3 cubic inches of fluid per revolution. As the wheel is turned, it pumps fluid from one side of the servo ram to the other. The steering fluid reservoir assembly in the engine room provides makeup oil and is closed to the atmosphere. Proper system operation requires a level of $\frac{1}{2}$ - $\frac{3}{4}$ and a head pressure of 20 to 30 PSI in the reservoir. A gauge at the reservoir displays pressure. The manual steering operates as a standard hydraulic system by supplying oil to either side of servo cylinder assembly in the lazarette. By responding directly to helm movement, the connected rudders move with little effort on the steering wheel. When the jog levers are used, an electronic signal is sent to the control which pumps fluid to the appropriate side of the servo ram. When energized, the autopilot system sends signals to the autopilot pump to control the operation of the servo ram.

F.2. Power Assisted System Operation

The power assist system operates in direct response to the manual steering system to give very high response steering with minimal effort. Two hydraulic pumps driven by the engines provide fluid flow in the power assist system. Fluid flows from the pump to the pump relief/flow control valve that controls system pressure including the manual helm steering circuit. In operation, pressure is only developed in the power circuit to bring about changes in rudder position. Under steady conditions, the power pumps circulate oil freely in the power circuit. The fluid enters the appropriate side of the port and starboard power cylinder in the servo/power cylinder unit in the lazarette. The servo cylinder commands the power cylinder to follow its movement and thus operate in direct response to helm movement. Another important function of this control assembly is that it provides automatic return to manual helm steering if the power pump flow is lost or interrupted.

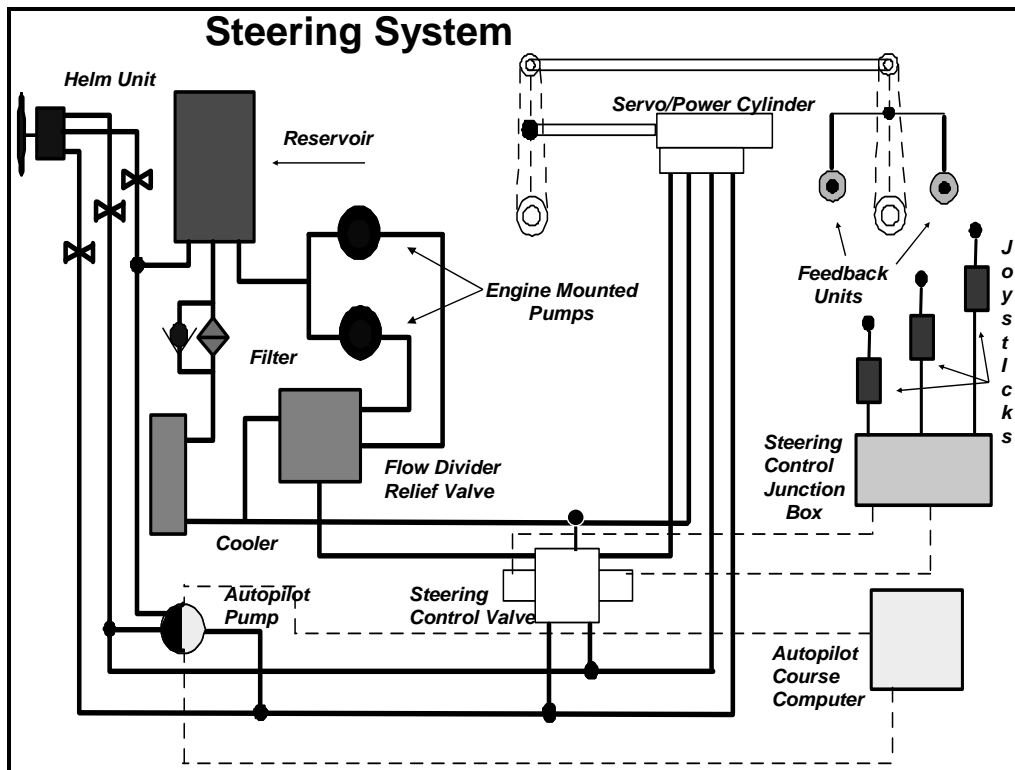


Figure 3-9
Steering System

F.3. System Reservoir

The hydraulic steering system has the reservoir assembly mounted on the starboard shell plating between Frames 2 and 3. It contains 1 gallon of oil and performs the following functions for the system:

Supplies oil for the two-engine drive power pumps.

A supply of filtered oil for both the helm unit and the autopilot pump assembly. The filter is a 10 micron rated filter.

Cooling (from the raw water system) to keep the system operating within operating parameters.


Continuous filtering of oil in the power assist circuit.




Section G. Heating, Ventilation, Air Conditioning System (HVAC)

Introduction The HVAC system heats, cools, and ventilates the Survivors compartment and the Enclosed Bridge. The system consists of two self-contained units located in the Enclosed Bridge and the Survivors compartment. Each unit can provide heating or cooling.

G.1. Control Units The control unit for the Enclosed Bridge HVAC system is located on the starboard bulkhead of the Enclosed Bridge. The control unit for the Survivors compartment is located just inboard of the ladder leading to the aft deck. The control units allow both manual and programmable control of heating and cooling within the two compartments.

NOTE  If power is removed from the compressor units, wait five minutes before restarting the system.

G.2. HVAC Raw Water System The HVAC system is cooled by a raw water system. The intake, valve, and simplex strainer for the HVAC raw water system are located to starboard of the keel in the Auxiliary Machinery Compartment. Two electrically powered raw water pumps pump water through hoses to the HVAC compressors in the Enclosed Bridge and Survivors compartment.

NOTE  The R/W valve must be open to use the HVAC system in the cooling mode.

G.3. Natural Ventilation Every compartment on the 47FT MLB is naturally ventilated. Refer to Chapter 2, Boat Characteristics.



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Section H. Electrical System

Introduction The 47FT MLB electrical system includes both AC and DC power distribution systems from several sources (**Figures 3-10 through 3-12**). The DC electrical and charging system is shown in **Figure 3-13**.

H.1. AC Power Sources AC Power is provided from two separate sources.

Shore Power

The shore power receptacle is located on the forward weather deck deckhouse bulkhead. All circuits requiring AC and DC power will operate when connected to shore power with the main breakers energized. These main breakers may be shore-side or they may be the ones located on the 120-VAC power panel in the Auxiliary Machinery Compartment.

While Underway

Two engine-driven AC, 5-kW generators provide the necessary AC power to the inverters for the HVAC systems. Each generator controller regulates AC power at 120 V, 60 Hz. This is only for boats with EC-037 not completed.

(See Appendix B: EC-037)

H.2. DC Power Sources DC power is supplied to the 47FT MLB by four engine-driven, 220-amp Balmar alternators and two banks of 8D marine type AGM batteries. From the alternators, power passes through voltage regulators, through battery disconnect cut-out switches located on Bulkhead 8 in the Survivors compartment, and then on to the batteries. All four alternators are outfitted with a load-sharing device, the center fielder, to prevent an overload of one alternator. Green LED indicator lights are mounted on port and starboard engine room gauge panels, which are energized whenever each respective alternator is producing voltage. This power is distributed through 24-volt DC and 12-volt DC power panels mounted in the Auxiliary Machinery Compartment.

(See Appendix B: EC-012, 025, 037)



H.2.a. Batteries The batteries installed on the 47FT MLB consist of two banks of 12-volt 8D marine type AGM batteries mounted in a drip proof laminated fiberglass box with a vented top to prevent accumulation of charging gasses. Each bank consists of two 12-volt 8D marine type AGM batteries connected in series to provide 24 volts terminal voltage. A battery disconnect cut-out switch panel mounted on port side of Bulkhead 9 in the Survivors compartment permits each battery bank to be disconnected from its intended starting or service load. Under normal conditions, the battery banks operate independently. However, in the event that the engine starter cannot provide enough current to start the engines, the two banks can be paralleled by closing the parallel switch located on the disconnect switch panel. Battery charging is performed in port by an AC powered battery charger in the Auxiliary Machinery Compartment. Underway, four engine-driven (Balmar) alternators generate DC power.

(See Appendix B: EC-012, 025)

H.3. Power Panels

Three power panels are installed in the Auxiliary Machinery Compartment.

- 120-VAC
- 12-volt
- 24-volt

H.3.a. 120 VAC power panel

The 120-VAC power panel is on Bulkhead 8 to port of the watertight door. This panel houses breakers for the two Victron inverters (40 AMP), two receptacles (15 AMP each) with ground fault protection, HVAC units (40 AMP each), and engine hot starts (30 AMP each). A separate shore power main circuit breaker panel is mounted on the port shell plating at Frame 9.

WARNING 

When AC alternator power is being used, the voltmeter and amp meter on the 120-VAC Power Panel will read zero but, in fact, power is present at the HVAC circuit breakers. Indication of power is on the Seapower remote status panel.



H.3.b. 12-Volt power panel

The 12-volt power panel is on Bulkhead 10 outboard of the 24-volt panel. This panel receives its power from the converters mounted on the starboard side of the 24-volt power panel.

NOTE 

If the 12-volt power supplies trip off line, secure the electronics and allow power supplies to cool. The temperature of the Auxiliary Machinery Compartment may get hot enough to prevent heat from the converters to dissipate. A thermo-switch will secure the units when overheated. Visually check the breaker to see if it has tripped. The possibility also exists that one unit is inoperative and the other is carrying the load, which will overload the functioning unit.

H.3.c. 24-Volt power panel

The 24-volt power panel is on Bulkhead 10 to port of the watertight door. This panel houses all 24-volt electrical service breakers for the boat. A voltage meter and amperage meter are installed at the top of the panel face.

CAUTION!

Secure the service batteries when securing the start system cutout switch or when removing power cables from the starter. A 24-volt potential exists on the negative cable due to the common ground of the two systems.

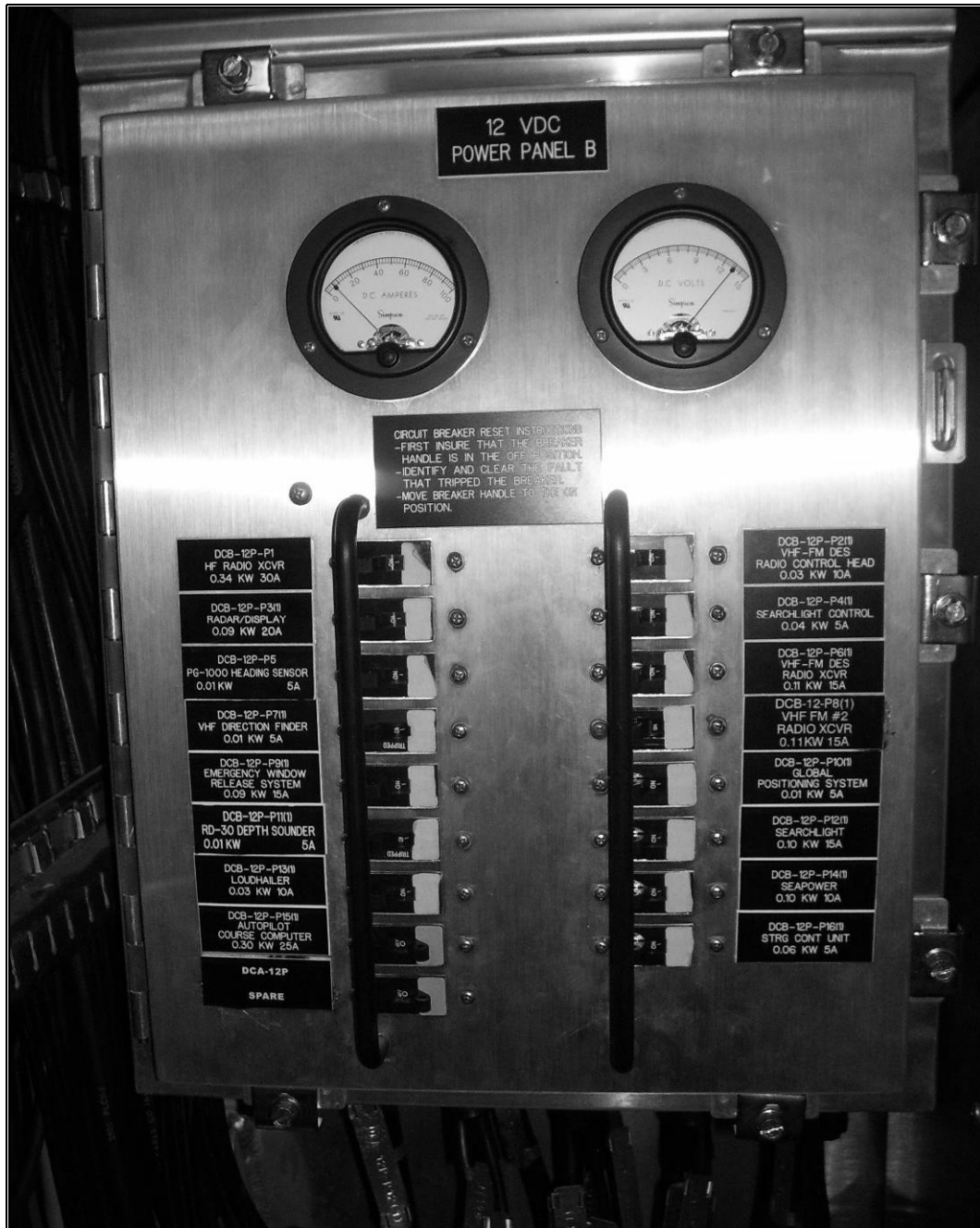


Figure 3-10
12 VDC Power Panel



Figure 3-11
120 VAC Power Panel

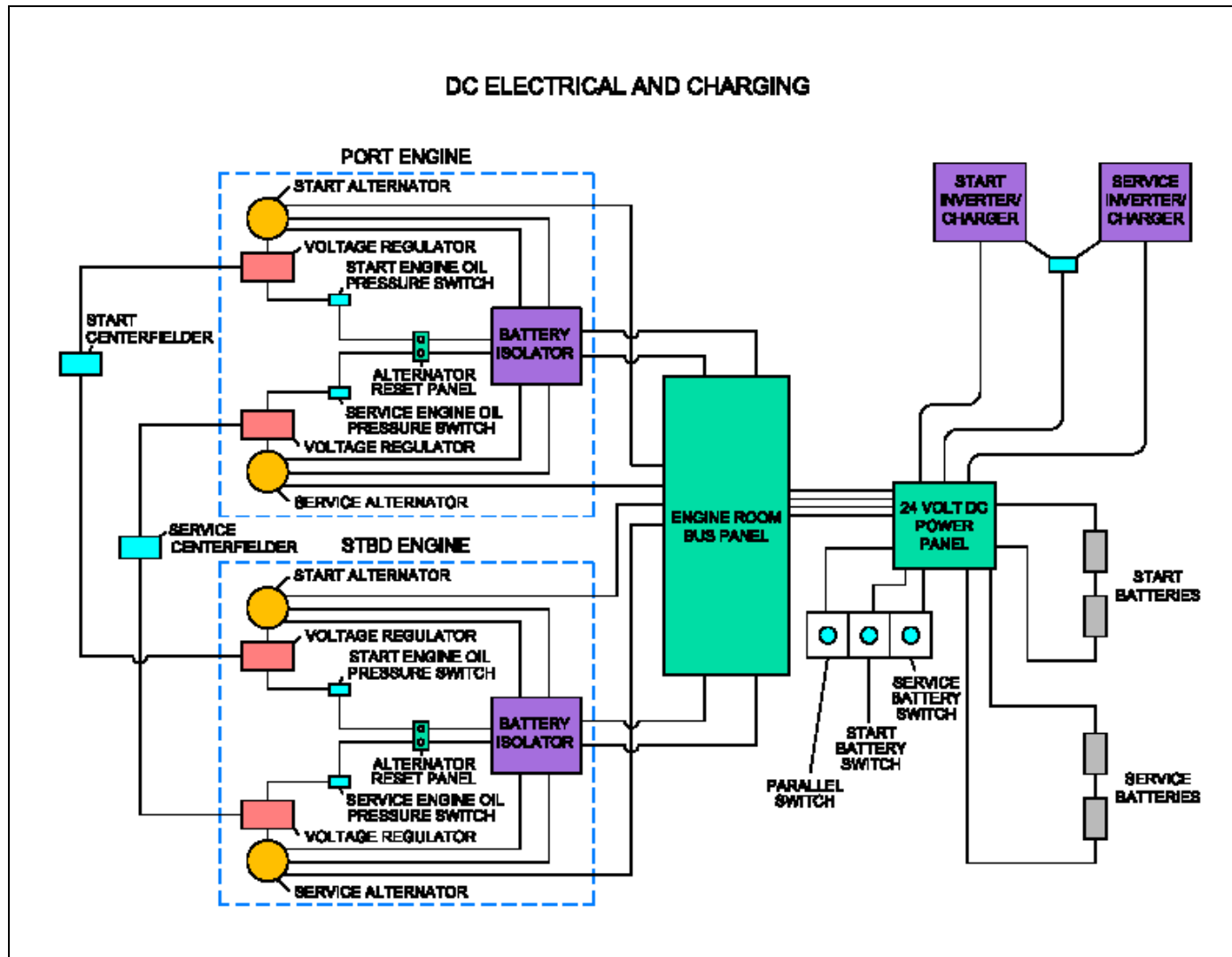


Figure 3-13
DC Electrical and Charging Diagram



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Section I. Emergency Systems

Introduction

This section describes emergency systems and actions to be taken if a casualty to the boat or one of the boat's systems occurs.

The best casualty control action is to prevent casualties through good maintenance and proper seamanship. If a casualty does occur, there must be timely execution of a predetermined plan of action to correct and/or prevent worsening of the situation. Frequent underway casualty control drills both prepare and improve the crew's response.

In this Section

This section contains the following information.

Topic	See Page
Emergency Window Release System (EWRs)	3-38
Engine Room Fire Suppression System	3-40
Installed Dewatering System	3-42
Bilge Flooding Alarm System	3-44
Fire Fighting	3-46



Emergency Window Release System

Introduction

In the case of damage to the pilothouse during a rollover, the EWRS (**Figure 3-14**) provides for automatic or manual opening of the port and starboard aft corner windows on the Enclosed Bridge. Water sensors are mounted on the port and starboard bulkheads near the overhead and trigger opening of the aft corner windows. When triggered, the EWRS provides for free transfer of water trapped in the Enclosed Bridge, which may affect stability.

I.1. System Configuration

The EWRS windows are mounted on spring-loaded hinges and are held closed and locked down by a sliding lock assembly. An EWRS air compressor and reservoir assembly mounted in the Auxiliary Machinery Compartment provides charge air to the release system. A backup CO₂ actuator is mounted on the overhead at the centerline in the Enclosed Bridge. Upon activation by the automatic sensors or the manual actuator, the charge system slides the locking bolt open that releases the spring-loaded windows.

(See Appendix B: EC-034)

I.2. Testing

The release system can be tested periodically by pressing the EWRS release test switch mounted just forward of the starboard window.

I.3. Re-Arming

The system can be re-armed by resetting the test switch, pressing the reset button next to each window, closing the windows and securing the slide locks.

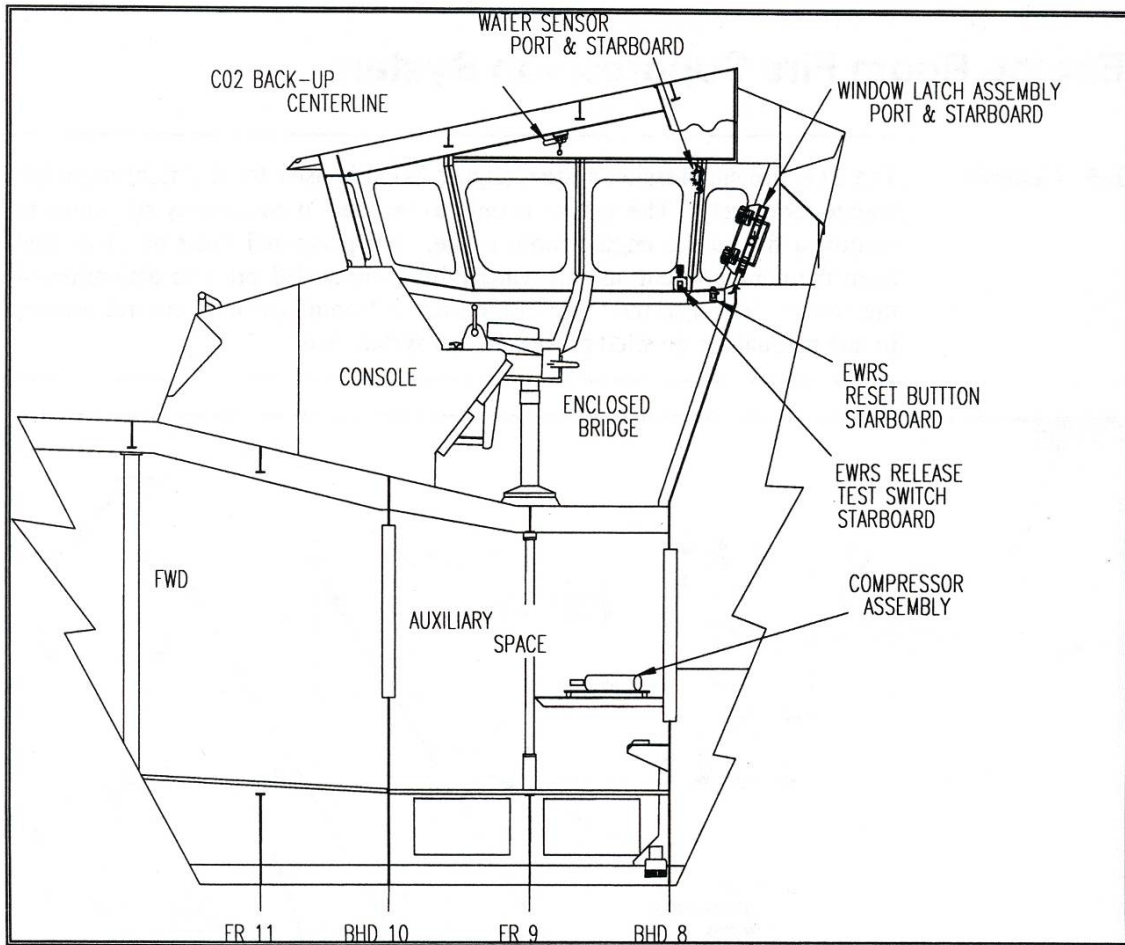


Figure 3-14
Emergency Window Release System



Engine Room Fire Suppression System

Introduction

The CO₂ fire suppression system (**Figure 3-15**) is used for fire fighting in the engine room only. The system is only to be used in emergency situations to control a fire in the engine room space. All personnel must be evacuated from the compartment and all watertight doors sealed prior to activation of the system. Refer to the “Fire in the Engine Room” casualty control section in this handbook for detailed procedures on system use.

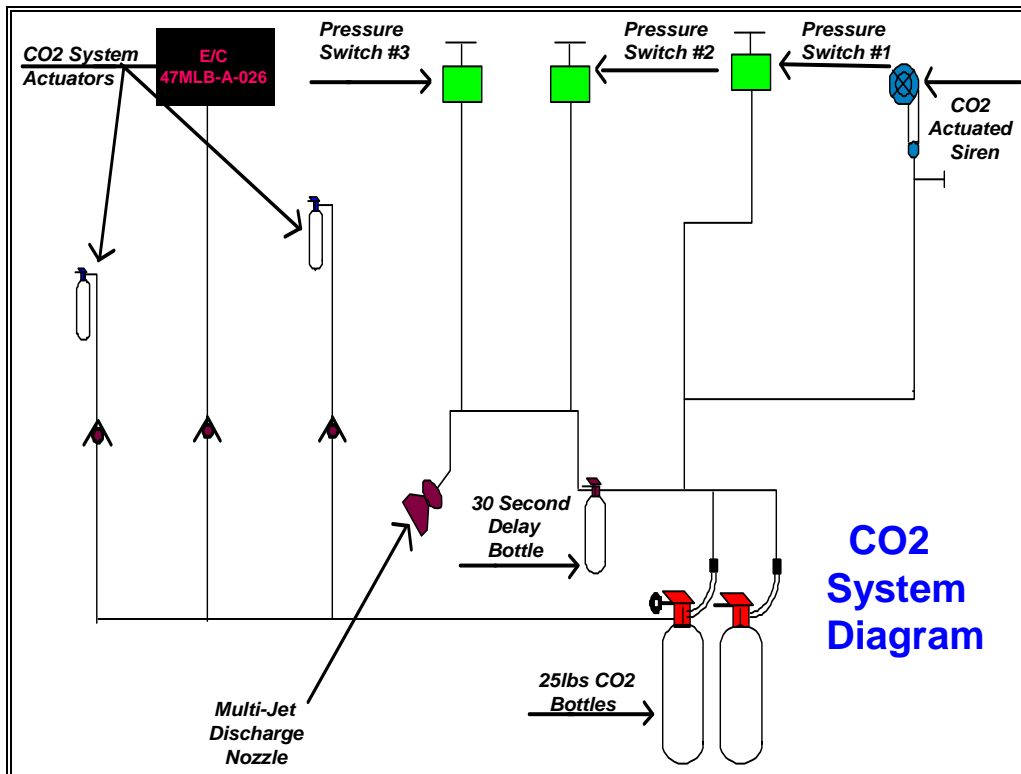


Figure 3-15
Engine Room Fire Suppression System



I.4. Storage Location

The primary CO₂ fire fighting agent is stored in two 25-lb bottles mounted in the Auxiliary Machinery Compartment to starboard of the watertight door on Bulkhead 10.

I.5. Activation

The CO₂ system can be activated from three locations on the 47FT MLB. Actuators (one located in the Enclosed Bridge and one in the Survivors compartment) puncture a nitrogen cylinder, which charges the activation piping. This activation system releases a pressure switch on the control head of the CO₂ storage containers. A third way to activate the system is by removing the locking pin and manually rotating the activation lever on the CO₂ bottle control head.

(See Appendix B: EC-026 and Amendment 1)

I.6. System Flow

Once the CO₂ has been released, the following events take place:

Step	Action
1	The discharge manifold lines are charged to a pressure operated siren and a pressure switch which energizes the pre-discharge warning strobe light, the engine stop solenoids, and the red "CO ₂ Pre-discharge" light located on the CO ₂ system indicator panel in the Survivors compartment. A separate line sends CO ₂ to a warning siren in the engine room.
2	Along a separate discharge line, the pressurized CO ₂ activates the time delay cylinder mounted on the aft starboard bulkhead of the Survivors compartment.
3	The discharge delay cylinder delays release of CO ₂ into the engine room compartment for 30 seconds. This delay allows time for the siren and strobe to warn personnel to evacuate the compartment. If all personnel are accounted for, or for manual activation in the event of malfunction, the delay cylinder may be overridden by rotating the manual control lever on the discharge delay cylinder.
4	Once the discharge delay cylinder is activated, CO ₂ will be released into the compartment. In addition, the discharged CO ₂ will pressure activate the engine room air damper and the red "CO ₂ Discharge" light located on the CO ₂ system indicator panel.



Installed Dewatering System

Introduction

The 47FT MLB is outfitted with seven 33 GPM submersible bilge pumps. Each bilge pump discharge line is fitted with an in-line check valve mounted in a horizontal position. The discharge hose is attached to a through-hull fitting with two hose clamps. A sensor switch is used to automatically energize the bilge pump at a set water level. The level switch is above the height of the bilge pump to avoid discharging oil floating on the bilge water. The alarm circuit is connected to the boat horn on the mast platform. This alerts the crew whether moored or underway.

NOTE

The installed bilge pump system is an EMERGENCY system only. It is not intended for general cleanup use.

I.7. Bilge Pump Selector Switch

The bilge pump selector switch may be placed in manual, off, or automatic. The selector switch will normally be placed in the automatic position.

CAUTION!

To place a bilge pump selector switch in manual position may result in a discharge of oil.

NOTE

It will require approximately 10" of water in a bilge space to activate the bilge pumps when set in the automatic mode.

I.8. Location of Pumps and Panel

The locations of each bilge pump and a schematic are provided in **Figure 3-16**. A control panel is in the Enclosed Bridge on Bulkhead 8 to starboard of the aft facing window.

I.9. CG-P6 Portable Pump

A separate method of emergency dewatering of the engine room is available through use of the CG-P6 portable pump connected to the dewatering standpipe (**Figure 3-17**) mounted on the aft buoyancy chamber. This standpipe takes suction from the engine room bilge.

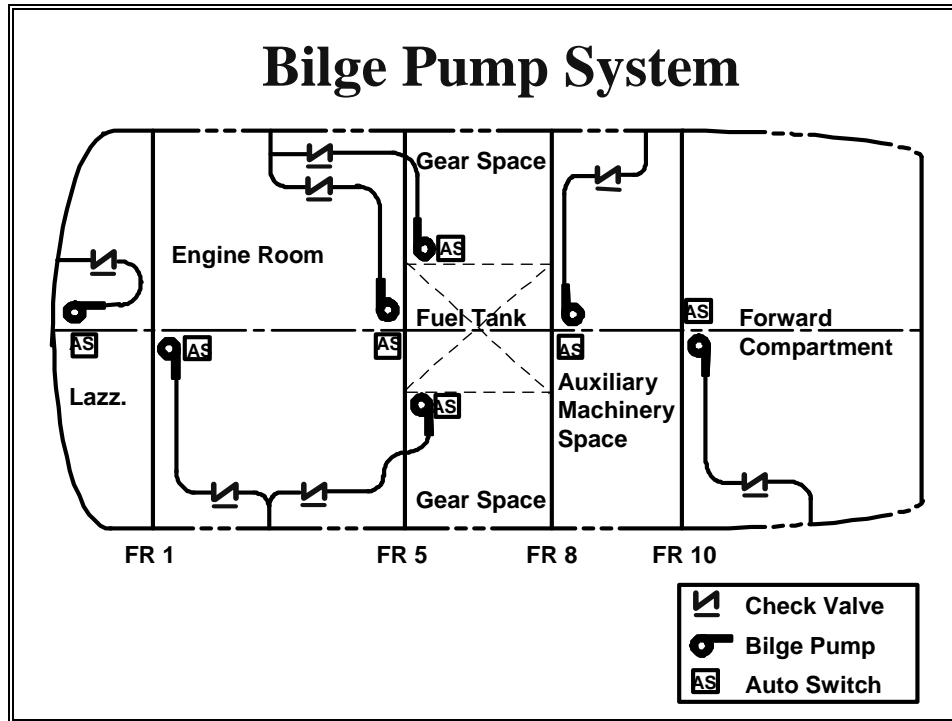


Figure 3-16
Bilge Pump System

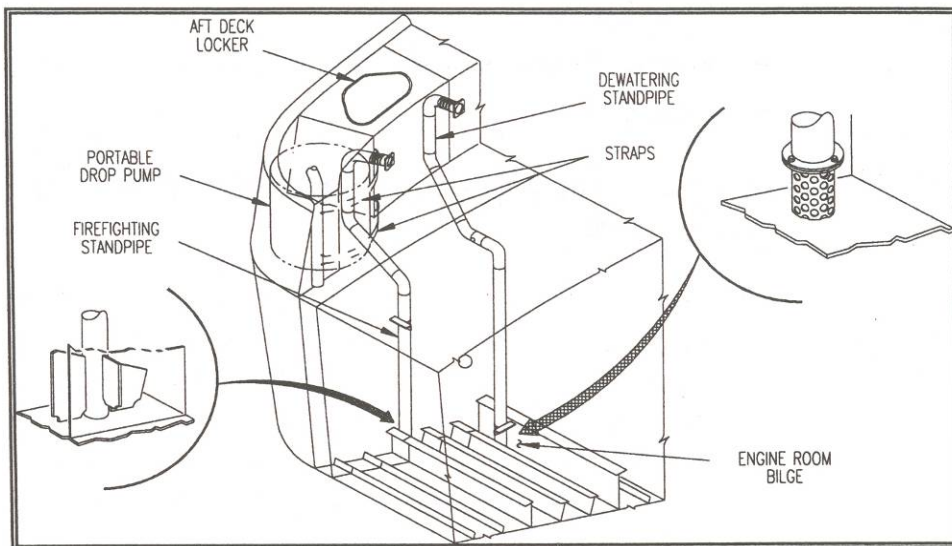


Figure 3-17
Dewatering & Fire Fighting Standpipes



Bilge Flooding Alarm System

I.10. Sensors The 47FT MLB is outfitted with six bilge flooding alarm sensors located near each 33 GPM submersible bilge pump, with the exception of the forward engine room bilge pump. The sensors are mounted approximately 5" below the bilge pump activation sensors and will activate the 47FT MLB's alarm prior to activation of the bilge pumps (**Figure 3-18**).

I.11. Operation The alarm system operates independently from the installed dewatering system; it serves only to alert the crew of bilge flooding. Sounding of the 47FT MLB's horn and a beeping on the alarm panel will indicate flooding. Pushing the silence button on the alarm panel may silence both. A selector switch is mounted to the alarm panel, labeled "Moored" and "Underway." In the event of flooding, the "Moored" mode will sound the horn continuously, whereas in the "Underway" mode, the horn will sound for approximately 8 seconds and then silence. The amber bilge alarm light, located on the Open Bridge, will remain energized regardless of which mode the selector switch is in.

(See Appendix B: EC-015)

I.12. Location The alarm panel is located in the Enclosed Bridge on Bulkhead 8 starboard side above the bilge pump control panel. A light on the panel indicates power to the system.

I.13. Spaces The sensors are distributed to provide flooding alert to five bilge spaces:

- Forward Compartment
- Auxiliary Machinery Compartment
- Gear Space (port and starboard)
- Engine Room
- Lazarette

A light on the panel indicates the space or spaces where bilge flooding has occurred.

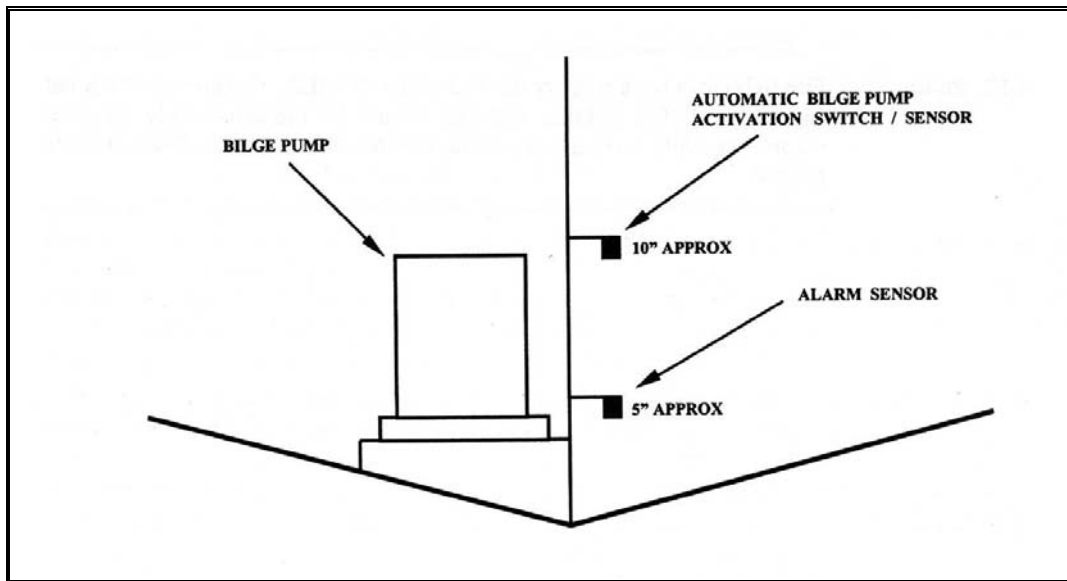


Figure 3-18
Bilge Flood Alarm System



Fire Fighting

I.14. Policy

Fire fighting is not a primary mission of the 47FT MLB. Because of its limited capability, all fire fighting activities should be limited to only those in accordance with Section 4.4.2.2 of the U.S. Coast Guard Addendum to the United States National SAR Supplement to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR), COMDTINST M16130.2 (series). Section 4.4.2.2 states that Coast Guard personnel shall not engage in independent fire fighting operations except to save a life or in the early stages of a fire to prevent a significant threat without undue risk. It also states that for fire fighting activities involving commercial vessels and waterfront facilities, Coast Guard personnel shall not actively engage in fire fighting except in support of a regular fire fighting agency under the supervision of a qualified fire officer.

NOTE

For further guidance on Coast Guard fire fighting policies, refer to the U.S. Coast Guard Addendum to the United States National SAR Supplement to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR), COMDTINST M16130.2 (series).



Section J. Communications/Navigation System

Introduction

All of the standard marine communications and navigation equipment is mounted in the Open and Closed Bridge of the 47FT MLB. The 47FT MLB utilizes a Scalable Integrated Navigation System (SINS) that is built around the Furuno NavNet radar/chart plotter system. The SINS system on the 47FT MLB includes the following:

1933C/NT Radar/Video Plotter
PG1000 Heading Sensor
GP-37 WAAS/DGPS Navigator
RD-30 Multi-Display Unit
235DT-SSE Depth Sensor

NOTE

Frequent operations and position reports between the boat and its operational control (OPCON) are critical to crew safety and timely mishap follow-up. Every boat must have the capability for communicating by radio to the station and other vessels. For radio protocol, channel selection and additional radio communication information, refer to Chapter 11 in the Boat Crew Seamanship Manual, COMDTINST M16114.5 (series); the Telecommunications Manual, COMDTINST M2000.3 (series); and the Radiotelephone Handbook, COMDTINST 2300.7 (series).

J.1. Raymarine 430 Loudhailer

The Raymarine 430 loudhailer (**Figure 3-19**) requires a 12-VDC input and provides 30 watts of output power to the loudhailer speaker on the forward face of the radar pod. The loudhailer has eight programmable foghorn signals to be used when operating in conditions of low visibility. The loudhailer and microphone are mounted on the Enclosed Bridge (lower console), as well as a microphone and speaker on the Open Bridge starboard console.



Figure 3-19
Raymarine 430 Loudhailer

**J.2. Motorola
VHF-FM Astro
Spectra W9
Transceiver
Control Head**

The Motorola VHF-FM Astro Spectra W9 transceiver control head (**Figure 3-20**) is mounted in the cabin on top of the port dash panel. The transceiver is located forward of the coxswain control cabin and is accessible through the cuddy cabin. The transceiver is used for communicating on VHF-FM marine band frequencies 146 to 174 MHz. The transceiver meets the Digital Encryption Standard (DES) requirements for APCO 25. The radio requires a 12-VDC power input. The radio antenna is located atop the cabin, port side.



Figure 3-20
Motorola VHF-FM Astro Spectra W9 Transceiver Control Head



J.3. Furuno NAVpilot

The Furuno Navpilot 500 Autopilot (**Figure 3-21**) is mounted on the Enclosed Bridge console and on the Open Bridge starboard console. It operates in two modes: Auto (Heading Control) and Nav (Track Control). This unit is electrically connected and completely compatible with the SINS equipment. The display modes available with this unit include Autopilot/Track control with rudder angle indication, L/L, Highway, Compass Rose, and two customizable displays. As with the SINS, the accuracy of this unit is completely dependant on the accuracy of the Electronic Compass (PG-1000).



Figure 3-21
Furuno NAVpilot

J.4. Magnetic Compass

A Nexus magnetic compass (**Figure 3-22**) is mounted on the centerline between the cabin windshields. It is the standby or backup compass used for navigation. The compass contains an internal gimbal system for maximum stability during adverse weather conditions. Built-in compensators provide for easy compass deviation adjustments. The blue dial is calibrated in white 5-degree increment markings. Lubber lines are provided at 45 degrees.



Figure 3-22
Magnetic Compass

**J.5. Furuno
1933C/NT
Radar/Chart
Plotter Display**

The Furuno 1933C/NT Radar Display (**Figure 3-23**) is located on the Open Bridge (Center Console) and the Enclosed Bridge (Lower Console). This surface radar/chart plotter has a 10.4-inch color LC display and utilizes a powerful X-band transmitter for reliable operation in all types of weather. This true color radar displays six levels of target density and is capable of tracking storms. The radar incorporates head-up, course-up, north-up, and true motion display modes. The range scales are from 0.125 to 48 NM, in 16-step increments. The Echo Trail intervals available are 15 seconds; 30 seconds; 1, 3, 6, 15, and 30 minutes; or continuous.

The plotter has a memory capacity of up to 8000 points for the boat's track and marks, 1000 waypoints, and 200 planned routes. Display modes include course plot, navigation data, steering display, and highway. Plot interval is adjustable from 1 second to 59 minutes, 59 seconds or 0.01 to 9.99 NM. Alarms available are guard zone, arrival/anchor watch, proximity alert, ships speed, water depth and temperature, and cross track error (XTE). A SAVE MOB function will immediately mark the MOB position and display the range and bearing of the man overboard location on the display.



Figure 3-23
Radar Display

**J.6. K-Band
Pedestal
Antenna**

The Furuno 4-kW K-Band Pedestal Antenna (**Figure 3-24**) is a compact radar antenna that has a maximum range of 36 NM and requires a 12-VDC input.

**J.7.
WAAS/DGPS
Receiver/
Antenna**

The Furuno Wide Area Augmentation System (WAAS)/Differential Global Positioning System (DGPS) Receiver/Antenna (**Figure 3-24**) is mounted on the radar pod. The antenna has 12 DGPS receiving channels and 1 WAAS receiving channel. The receiver/antenna can decode correction signals from WAAS/DGPS and provide these signals to the 1933C/NT radar display and the GP-37 WAAS/DGPS navigator. The position accuracy for the GPS is 10 m; the DGPS, 5 m; and the WAAS, 3 m. The receiver/antenna requires a 12-VDC input.

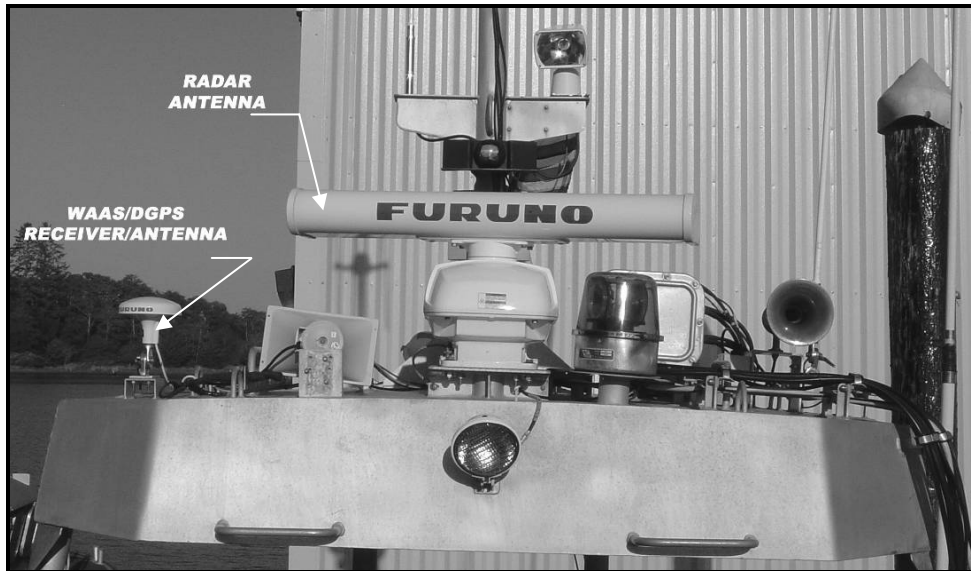


Figure 3-24
Radar Antenna WAAS/DGPS Receiver/Antenna

**J.8. RD-30
Multi-Display**

The RD-30 Multi-Display (**Figure 3-25**) is mounted on the Open Bridge Starboard Console and the Enclosed Bridge Center Console. The RD-30 utilizes a wide variety of navigation data and displays it in digital and analog (graphic) formats. The multi-display uses input from the depth/temperature sensor, speed wheel transducer, radar, WAAS/DGPS receiver/antenna, and the PG 1000 heading sensor to provide essential navigational information. The unit features a 4½-inch backlit LCD and has five user programmable displays. The RD-30 has ten conditions that can trigger audio and visual alarms:

- Speed
- Water temperature
- Depth
- Arrival/anchor watch
- XTE
- Trip distance (two alarms)
- Countdown timer
- Alarm clock
- No position fixing
- No position data

The RD-30 requires 12-VDC input.



Figure 3-25
RD-30 Multi Display

NOTE 

WAAS is not currently approved for use by Coast Guard vessels.

**J.9. GP-37
WAAS/DGPS
Receiver and
Navigator**

The GP-37 WAAS/DGPS Receiver and Navigator (**Figure 3-26**) is mounted on the port side of the Enclosed Bridge Console. The GP-37 is a totally integrated DGPS receiver and video plotter. The GP-37 can track up to 13 satellites (12 DGPS, 1 WAAS) simultaneously using the WAAS/DGPS receiver/antenna.

Display modes available are: plotter, NavData (position indication in latitude, longitude or LORAN), steering (vessel course, position, speed), and highway. The GP-37 has five available alarm functions and a memory capacity of 1000 points of vessel track, 999 waypoints or marks, and 50 routes comprised of up to 30 waypoints. The GP-37 has an accuracy of 5 meters or better with DGPS. In the AUTO mode, the GP-37 runs with DGPS as the default setting. If the DGPS signal is lost for any reason, the WAAS mode is automatically selected. Consult the Furuno Operator's Manual for the GP-37 DGPS Navigator to enable the AUTO mode from the Menu selection. In addition, the Course Over Ground feature on the GP-37 WAAS/DGPS Receiver and Navigator is unaffected by Electro Magnetic Interference and therefore can also be used in combination with the digital compass.

The GP-37 DGPS Receiver feeds latitude and longitude data to the SINS equipment; however, it is a stand-alone DGPS in all other aspects. Recommend all regularly used Routes be loaded into this unit for use when the SINS equipment experiences a failure.

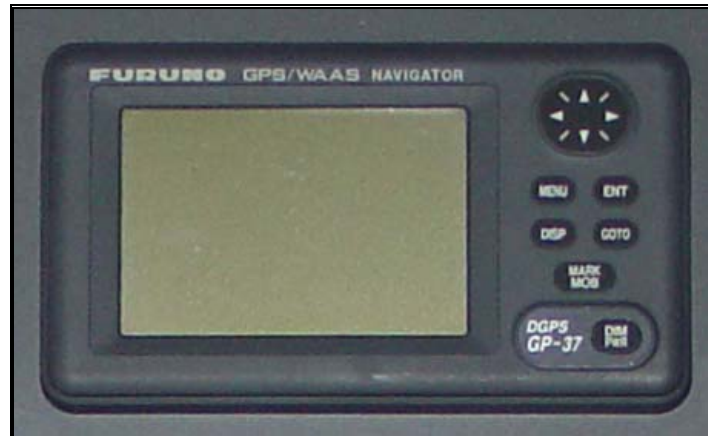


Figure 3-26
GP-37 WAAS/DGPS Receiver and Navigator

**J.10. PG-1000
Heading Sensor**

The PG-1000 Heading Sensor (**Figure 3-27**) is mounted in the Forward Compartment under the deck grating at Frame 11. The sensor detects terrestrial magnetism and produces heading data, which can be utilized by navigation system components that need accurate and stable heading input. The heading accuracy of the sensor is ± 1 degree. The compass sensor requires a 12-VDC power source. The accuracy of the digital compass should be frequently checked by steering a known range, and calibrated in accordance with the manufacturer's instructions. If the boat experiences electronic problems, operates in a new geographic region, or requires recalibration for some other reason, record the results of the accuracy check in Part 1 of the Boat Record.

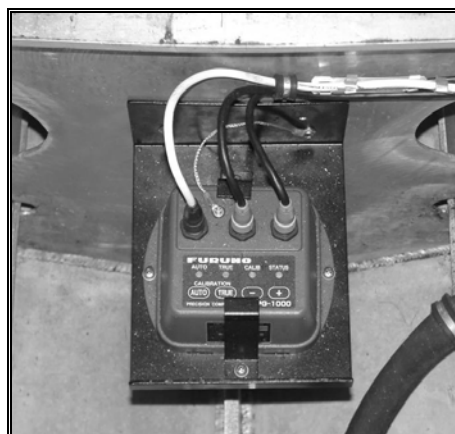


Figure 3-27
Heading Sensor



J.11. 235DT-SSE Depth and Temperature Sensor

The 235DT-SSE Depth and Temperature Sensor (**Figure 3-28**) is mounted in a thru-hull fashion in the forward Port side of the Survivors compartment. There is another thru-hull Transducer mounted through the Starboard side of the hull in the forward Survivors compartment which feeds “Speed through the water” information to the RD-30 multi display. The RD-30 multi-display has programmable alarm set-points and menu selectable displays for water temperature and depth that require input from the 235DT-SSE sensor.



Figure 3-28
235DT-SSE Depth and Temperature Sensor

J.12. Simrad Taiyo TD-L1550A

The TD-L1550A Automatic VHF Direction Finder (**Figure 3-29**) is mounted in the Enclosed Bridge Starboard side of the console. The antenna is mounted at the top of the mast.



Figure 3-29
Direction Finder



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Section K. Weapons Mounting

Introduction

Engineering Change (EC-032) authorized the installation of a machine gun tripod on the foredeck of the 47FT MLB to support missions requiring armed vessels. The tripod provides a foundation for the MK-16 MOD 8 stand and either the M240B or M60 machine gun.

NOTE

Weapons allowances for Coast Guard boats are established by CG-7713.

K.1. Machine Gun Elevation and Train Stop Limits

The gun mount location on the foredeck is approximately 13' aft of the bow and creates challenges in setting mount depression stops. Upward pressure on the butt stock of the M240B or M60 machine guns at maximum depression can create a subtle drop in the axis of the barrel bore, which can lower the bullet's travel over the handrail anywhere between one and four inches from the original stop setting.

Setting the gun mount depression stop to six inches above the handrail will provide an adequate buffer that takes into account both the maximum depression stop setting and flex of the machine gun.

The servicing sector or area armory should perform the initial set for the train, elevation, and depression stops. Once the stops are set, the mounts should be stamped with the 47FT MLB's hull number. Only use the mount marked for the specific 47FT MLB. Do not use the mount on any other vessel.

CAUTION!

The MK-16 MOD 8 stand is the only stand authorized for use aboard the 47FT MLB. The MK-16 MOD 8 stand shall be used with the MK-97 mount (for the M-240B machine gun) or the MK-82 mount (for the M-60 machine gun). Under no circumstances shall the UTB M-60 mount be used aboard a 47FT MLB, as these mounts are one-of-a-kind design, specifically made to work only on UTBs. Units should contact their servicing armory if in doubt as to the appropriate weapon or weapon mount configuration.



K.2. Pre-Mission Procedures

Prior to getting underway, ensure the machine gun and mount are properly secured. Check train, elevation, and depression of the mount in accordance with Chapter 16 of the Ordnance Manual, COMDTINST M8000.2 (series).

To check for the proper depression, use a laser bore scope and ruler to ensure that the muzzle of the weapon is pointing at least six inches above the handrail. Procedures are as follows:

Step	Action
1	Insert the laser bore scope into the weapon muzzle or chamber (dependant on make and model of scope). Do not allow recoiling parts to contact the laser bore scope if inserted into the chamber.
2	Place a ruler on top of the forward most point of the handrail.
3	Adjust the position of the machine gun muzzle so that the laser points to the six inch increment on the ruler.
4	Set the gun mount depression stop.

CAUTION!

The servicing Sector or Area armory should perform the initial set for the train, elevation, and depression stops. Once the stops are set, the mounts should be stamped with the 47FT MLB's hull number. Only use the mount marked for the specific 47FT MLB. Do not use the mount on any other vessel.

Also check the gun mounts prior to getting underway.

MK-82 Mount: The MK-82 mount supports the M60 machine gun. Check mounting bolts on both sides of the cradle to ensure the bolts are tight. The cradle assembly on the mount is attached by two shoulder bolts. Over time, constant vibration and weathering can cause the shoulder bolts to wear on the brass inserts supporting the bolts. This wear and tear can create play (space) between the mount and cradle. Detailed information on the MK-82 mount can be found in the Small Arms Machine Gun Mount MK-82 MOD 2, SW361-A2-MMM-010.



MK-97 Mount: The MK-97 mount supports the M240B machine gun. Ensure that the locking nut (**Figure 3-30**) for the elevation depression stop is located at the top of the sleeve and used for securing the stop. Fastening the locking nut to the end of the elevation depression bolt may limit the mount's overall depression setting. **Figure 3-30** shows the proper position of the locking nut. Detailed information on the MK-97 mount can be found in the Small Arms Machine Gun Mount MK-97 MOD 0, SW360-AJ-MMO-010.



Figure 3-30
MK-97 Locking Nut



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CHAPTER 4 CREW REQUIREMENTS

Introduction

The U.S. Coast Guard Boat Operations and Training Manual (BOAT) Volume I and II, COMDTINST M16114.32 (series) and M16114.33 (series), respectively, provides minimum standards and guidelines for competence on board the 47FT MLB. Each crew member should be familiar with the duties of the other crew members in addition to his/her own duties. It is important for a crew member to know and commit to memory all-important characteristics of the boat and its equipment, and which procedures to follow in the event of a casualty. Each crew member should mentally rehearse the procedures each member of the crew would follow during any operational casualty. Teamwork is the common thread that allows the crew to succeed. Whenever the opportunity is available, the crew should get the boat underway to practice operational and emergency procedures.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Minimum Crew	4-3
B	Coxswain	4-5
C	Engineer	4-7
D	Crew Members	4-9
E	Passengers and Survivors	4-11
F	Training	4-13
G	Safety Equipment	4-15



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Section A. Minimum Crew

A.1. Certified Crew

The minimum certified crew requirement for the 47FT MLB shall be in accordance with the U.S Coast Guard Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series). Additional crew may be necessary as determined by the nature of the specific mission undertaken.



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Section B. Coxswain

Introduction

The Coast Guard places great trust in each coxswain and his or her ability to accomplish the assigned missions in a safe and professional manner, even under adverse conditions. The position of coxswain is one of high regard and great responsibility.

The coxswain is responsible for the boat and its crew during every mission. The coxswain assigns and directs all onboard functions during each operation.

B.1. Authority and Responsibility

The extent of the authority and responsibility of the coxswain is specified in the U.S. Coast Guard Regulations Manual, COMDTINST M5000.3 (series) as follows:

"The coxswain shall be responsible, in order of precedence, for the safety and conduct of passengers and crew; the safe operation and navigation of the boat assigned; and the completion of the sortie or mission(s) assigned or undertaken pursuant to USCG policy and regulations. An underway coxswain will at all times respond within the limits of capabilities and legal authority to observed hazards to life or property, and violations of law or regulations."

The coxswain is the direct representative of the Commanding Officer (CO) or Officer-in-Charge (OIC) and, as such (subject to Articles 88-89 of the UCMJ), has the authority and responsibilities that are independent of rank or seniority in relation to other personnel embarked. The authority and responsibility of the coxswain exist only when the boat is engaged on a specific sortie or mission.

B.2. Relief of Responsibility

The only person embarked in the boat who may relieve the coxswain of the responsibility as described above is:

The CO/OIC, Executive Officer (XO), or Executive Petty Officer (XPO).

A senior officer at the scene of a distress emergency or other abnormal situation who exercises authority under the provisions of USCG Regulations, whether or not other units are involved.



**B.3. Operating
in Heavy
Weather**

Operating in surf, heavy weather, or breaking bar/inlet conditions without an experienced coxswain can seriously jeopardize the safety of the boat, its crew and the mission. The coxswain must consider many factors when operating in heavy weather or surf. These factors include case severity, experience of the crew, period and type of breaking waves, water and air temperature, and forecasted weather. The above describes the principal roles and knowledge required of the surfman, which is an advanced coxswain certification.

NOTE 

During all risk assessment decision making processes, crew members, coxswains, surfmen, unit commands and all elements exercising operational control over a boat shall consider individual boat capability, crew assignments, and the nature of distress when assigning response units when *heavy weather* conditions exist or are likely to be encountered. Heavy weather is determined to exist when seas exceed 8' or winds are greater than 30 knots.

NOTE 

Surf conditions exist when breaking seas exceed 8' and/or when, in the judgment of the CO/OIC, rough bar/surf conditions exist and/or whenever there is doubt in the mind of the coxswain as to the present conditions. For further guidance on crew limitations, refer to the U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series).



Section C. Engineer

Introduction

The position of boat engineer is one of great responsibility. The knowledge and skill of the engineer can make the difference in completing the mission under adverse conditions.

C.1. Qualifications

The boat engineer must be a certified crew member prior to obtaining certification as a boat engineer since this individual is required to perform duties in both capacities.

C.2. Responsibilities

The primary responsibilities of this position include operational and underway maintenance of the propulsion and auxiliary systems.

The engineer may also serve as:

- senior crew member
 - safety observer
 - boarding officer
 - line handler
 - helmsman
 - surface swimmer
 - emergency medical technician
 - or other such duties as may be assigned by the coxswain in support of operational and training sorties or missions.
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Section D. Crew Members

Introduction Under direct supervision of the coxswain, the crew member is responsible for line handling, acting as lookout or helmsman, maintaining a towing watch, and assisting the coxswain as required during all evolutions or maneuvers.

D.1. Certified Crew Member The crew member must be certified in accordance with the U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Vol. I, COMDTINST M16114.32 (series) and U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Vol. II, COMDTINST M16114.32 (series).

D.2. Additional Crew Members Additional crew members are assigned by the coxswain and certified by the CO/OIC based upon mission requirements.



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Section E. Passengers and Survivors

Introduction

Since passengers and survivors may not have any vessel or equipment knowledge, it is important they receive a basic safety brief prior to getting underway or soon after coming aboard. They should be provided with adequate safety or personal protective equipment based on the mission or situation. At a minimum, each shall wear an appropriate personal flotation device. When riding alone or rescued from adverse conditions, each person should be safely protected through use of boat crew safety belts or the installed seatbelts of the 47FT MLB seats.



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Section F. Training

Introduction

Qualification, certification and assignment as a crew member on a 47FT MLB requires considerable time, effort and practice. The individual must learn the characteristics of the boat and its missions, as well as the adverse conditions of the sea and the environment in which the boat operates. Each break-in crew member must take the time to study his or her duties in addition to the duties of the other crew members since it may be necessary to perform any given duty in the event of an emergency.

F.1. Standards for Qualification

The U.S. Guard Boat Operations and Training (BOAT) Manual, Volume II, COMDTINST M16114.33 (series) provides the standards for qualification as Coxswain, Heavy Weather Coxswain, Surfman, Boat Engineer, and Crewman aboard the 47FT MLB.

F.2. Training Underway

Where staffing permits, additional personnel may ride the boat in a training capacity to enhance their familiarity with the boat. To become and remain proficient as a crew member on this or any boat, an individual must get underway and practice his or her skills repeatedly.



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Section G. Safety Equipment

G.1. Personal Protective Equipment

During all 47FT MLB operations, crew members shall wear personal protective equipment as required by the Rescue and Survival Systems Manual, COMDTINST M10470.10 (series) and the Boat Crew Seamanship Manual, COMDTINST M16114.5 (series) for clarification.

NOTE

The coxswain is responsible for ensuring that all required personal safety equipment is worn, and worn correctly.

G.2. Protective Equipment During Heavy Weather/Surf

In accordance with the Heavy Weather Addendum of the Boat Crew Seamanship Manual, COMDTINST M16114.5 (series), crews operating in heavy weather or surf must be properly equipped, as follows:

Required hypothermia protective clothing.

Helmet (helmet strap must be secured and adjusted properly).

Survival vest and equipment.

Waterproof footwear and boots should be worn.

Eye protection may be necessary for visibility, particularly for persons wearing glasses, and will also protect against glass shards should a window be broken.

Boat crew safety belt must be worn and adjusted correctly.

Personal seat belt must be worn when in a seat.

The coxswain is responsible for ensuring that all required equipment is worn, and worn correctly.

G.3. Waivers

In accordance with the Coast Guard Rescue and Survival Manual, COMDTINST M10470.10 (series), COs/OICs, on a single mission basis only, may waive the requirement for wearing a hypothermia protective device only after a determination that the risk associated with crew performance degradation, thermal stress, and environmental considerations are offset by the benefits associated with the waiver.



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CHAPTER 5

OPERATIONAL GUIDELINES

Introduction

This chapter describes how to use the 47FT MLB in the safest and most efficient manner. These policies and performance criteria should be used as guidelines for 47FT MLB operations. Within these guidelines, consider local operating conditions, District regulations, and the skill of the crew to determine how the 47FT MLB's capability is to be used. These factors must be considered prior to each sortie or mission.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Operating Parameters	5-3
B	Performance Data	5-7



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Section A. Operating Parameters

Introduction

The readiness of the 47FT MLB shall be continuously monitored to ensure that the boat is capable of unrestricted operations. This monitoring is accomplished through a variety of formal and informal inspection programs including daily boat checks, the boat PMS schedule, annual engineering inspections, Ready For Operations evaluations, and Standardization Team Assessments. Whenever a discrepancy is noted during any of these inspection programs, it must be classified and acted upon based on the following standards.

A.1. Disabling Casualties

Disabling casualties are those which make the 47FT MLB not serviceable. Appendix D contains a listing of disabling casualties.

A.1.a. Actions (underway)

In the event the 47FT MLB sustains a disabling casualty while underway, the 47FT MLB shall immediately return to the nearest safe mooring, if able, and immediately be placed into “Charlie” status. In many cases, the 47FT MLB will require assistance from another vessel.

A.1.b. Actions (dockside)

If a disabling casualty is identified while the 47FT MLB is moored, the 47FT MLB is not authorized to get underway until the casualty is corrected. The 47FT MLB shall immediately be placed into “Charlie” status and repaired. Dockside materiel inspections may continue after discovery of a disabling casualty, but the 47FT MLB shall not get underway for full power trial or underway exercises until all disabling casualties are fully repaired.

NOTE

Operational Commanders may authorize, *in writing*, the movement of the 47' MLB for short distances under its own power only to facilitate haul-outs or corrective maintenance. This authority may be delegated, but must remain higher than the unit CO/OIC.

A.1.c. Reports

Disabling casualties shall be reported to the Operational Commander by the most expeditious means, followed up by a boat status message as soon as possible, but no later than 12 hours after the casualty is discovered. If the casualty cannot be repaired within 48 hours, a CASREP shall be sent within 24 hours of discovery of the casualty in accordance with Casualty Reporting (CASREP) Procedures Manual, COMDTINST M3501.3 (series). Operational Commanders are responsible for monitoring the status of repairs to disabling casualties.



A.2. Restrictive Discrepancies

Restrictive discrepancies are those which restrict the operations of the 47FT MLB such that it can perform some missions, but not all missions safely. 47FT MLBs with restrictive discrepancies shall only be operated if the Operational Commander has issued a written waiver. A verbal waiver is authorized as long as it is followed with a written waiver within 4 hours. The ultimate authority for 47FT MLB waivers resides with the Sector or Group–Air Station Commander, but may be delegated to the Response/Operations Department Head.

Appendix E contains a listing of restrictive discrepancies.

NOTE 

A written waiver may be a letter, memorandum, e-mail, or record message traffic. The written waiver shall: (1) identify the specific discrepancy which is waived, (2) describe the conditions under which the 47FT MLB may be operated, and (3) concur on the measures to be taken to lessen or negate the hazard posed by the discrepancy. Written waivers shall be maintained as an annotation to Part 3 of the 47FT MLB record.

A.2.a. Actions (underway)

In the event the 47FT MLB sustains a restrictive discrepancy while underway, the coxswain shall immediately notify the parent unit with all pertinent information and a recommendation whether to continue or abort the mission. The parent unit shall pass along the information pertaining to the casualty, the current mission, and recommendations to the Operational Commander who shall immediately notify the unit as to whether or not continuing the mission is authorized, the conditions under which the 47FT MLB may be operated, and precautions to be taken to lessen the hazards posed by the discrepancy.

A.2.b. Actions (dockside)

The 47FT MLB shall not get underway until the discrepancy is corrected or a waiver has been received. Dockside materiel inspections may continue after discovery of a restrictive discrepancy, but the 47FT MLB shall not get underway for full power trial or underway exercises until all restrictive discrepancies are fully repaired or have been waived by the Operational Commander.



A.2.c. Reports Restrictive discrepancies shall be reported to the Operational Commander if the discrepancy cannot be repaired within 1 hour. If the casualty cannot be repaired within 48 hours, a CASREP shall be sent within 24 hours of discovery of the casualty in accordance with Casualty Reporting (CASREP) Procedures Manual, COMDTINST M3501.3 (series). Operational Commanders are responsible for monitoring the status of repairs to all restrictive discrepancies.

A.3. Major Discrepancies Major discrepancies are those that degrade the effectiveness of the boat to perform one or more missions. The occurrence of major discrepancies shall be documented, and a plan to correct these discrepancies shall be formulated and carried out by the unit. Operational Commanders are responsible for monitoring the status of the repairs to major discrepancies. It is suggested that, in conjunction with unit materiel inspections, Operational Commanders receive monthly reports as to the status of correction of major discrepancies.

Appendix E contains a listing of major discrepancies.

A.4. Minor Discrepancies Minor discrepancies do not affect the operational readiness of the boat. However, a boat with minor discrepancies does not meet the standardization criteria as established for that boat. The occurrence and repair of minor discrepancies shall be documented and monitored at the station/unit level.

In the event that the addition of portable equipment, not part of the standard boat outfit, is necessary to meet mission needs, units are authorized to temporarily carry this extra equipment. This authorization is on a case by case basis only, and care must be taken to properly secure any extra gear and to ensure it does not interfere with safe egress or the boat's standard outfit/systems. Under no circumstances shall permanent alterations be made to power, stow, or in any way accommodate extra equipment.



A.5. Environmental Limits

The 47FT MLB is built to operate safely under surf conditions within its design limits. With approval from the operational commander, crews may operate the boat in conditions that exceed the environmental limits; however, the coxswain is ultimately responsible and must always make the final determination whether the boat and crew can safely perform the mission.

- 30' seas
- 20' surf (breaking seas)
- 50 knots sustained winds
- 50 nautical miles offshore
- 150 displacement tons tow load

NOTE 

These limits may be exceeded by approval of the operational commander ONLY after appropriate risk assessment for the situation at hand is made. On-scene conditions provided by the On-Scene Commander and 47FT MLB coxswain must be considered in the risk assessment process. The coxswain retains the final on-scene decision as to whether or not an action may be safely executed.

A.6. Additional Stability Limits

Certain stability criteria were established so that the 47FT MLB is capable of self-righting under adverse conditions and meeting other stability limits. Based on these criteria, when operating the MLB at the upper end of its operating limitations (30' seas, 20' surf, 50 knot winds) that may present a risk of capsizing, no more than 6 persons shall be on the open bridge. During light load conditions in heavy weather (fuel capacity less than 1/2), no more than 5 persons shall be on the open bridge.

In an extreme mass casualty situation in adverse weather (upper end of operating limitations), the boat may carry up to 30 persons onboard within the limits of these stability criteria. These persons shall be distributed as evenly as possible throughout the boat, towards the centerline. During this type of incident, the boat crew should operate from the enclosed bridge to enhance stability.



Section B. Performance Data

B.1. Fuel Consumption

Fuel consumption and operating range is affected by engine tuning, weather conditions, trim, type of evolution (towing, searching, etc.) and operating area (e.g. shallow water increases resistance, decreases range). **Figure 5-1** shows typical fuel consumption at full load condition with no tow. **Figure 5-2** shows the operating range of the 47FT MLB at various speeds.

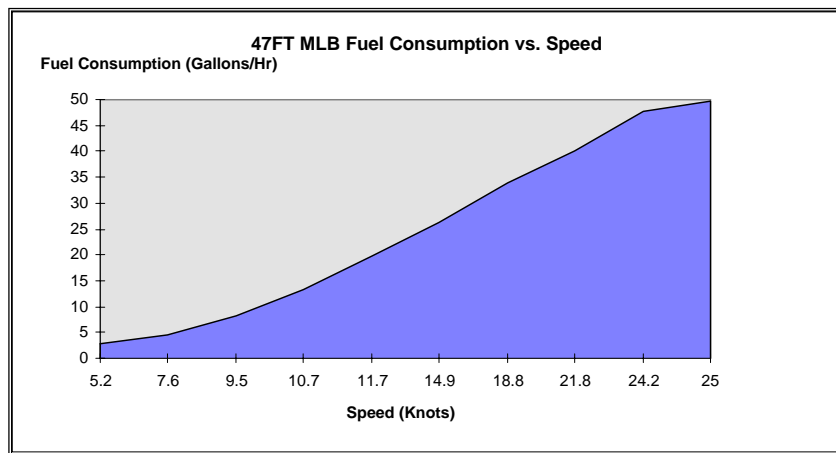


Figure 5-1
Fuel Consumption vs. Speed

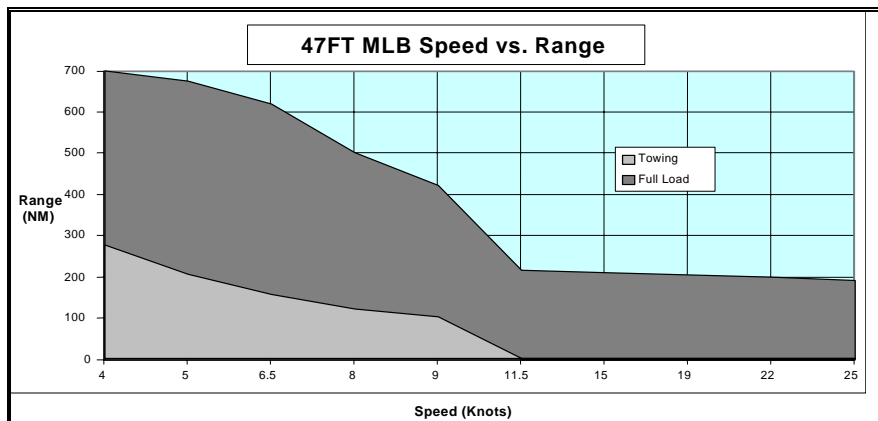


Figure 5-2
Range vs. Speed



B.2. Seakeeping **Figure 5-3** shows maximum safe operating speed of the boat as a function of sea height (head seas). Head seas operation is generally considered the slowest heading.

WARNING 

The coxswain is responsible for ensuring that all required personal safety equipment is worn, and worn correctly.

B.3. Turning Turning radius is affected internally by the boat’s speed, rudder angle and hull design, and externally by wind, current and wave action. Because of the hull design and inherently stable straight-line tracking of the 47FT MLB, full speed/full rudder turns are not accomplished quickly. See the “Handling Characteristics” section of this chapter for methods to plan effective turns. **Figure 5-4** shows typical rudder-only turning performance.

B.4. Stability The 47FT MLB’s righting arm (an indication of the vessel’s tendency to return to upright) decreases between approximately 70 and 110 degrees of heel before it increases dramatically. This means that once the boat has been pushed past 70 degrees roll by a dynamic external force (wave), it may be likely to roll to at least 110 degrees. Beyond 110 degrees, the 47FT MLB’s righting arm increases dramatically acting to right the vessel.

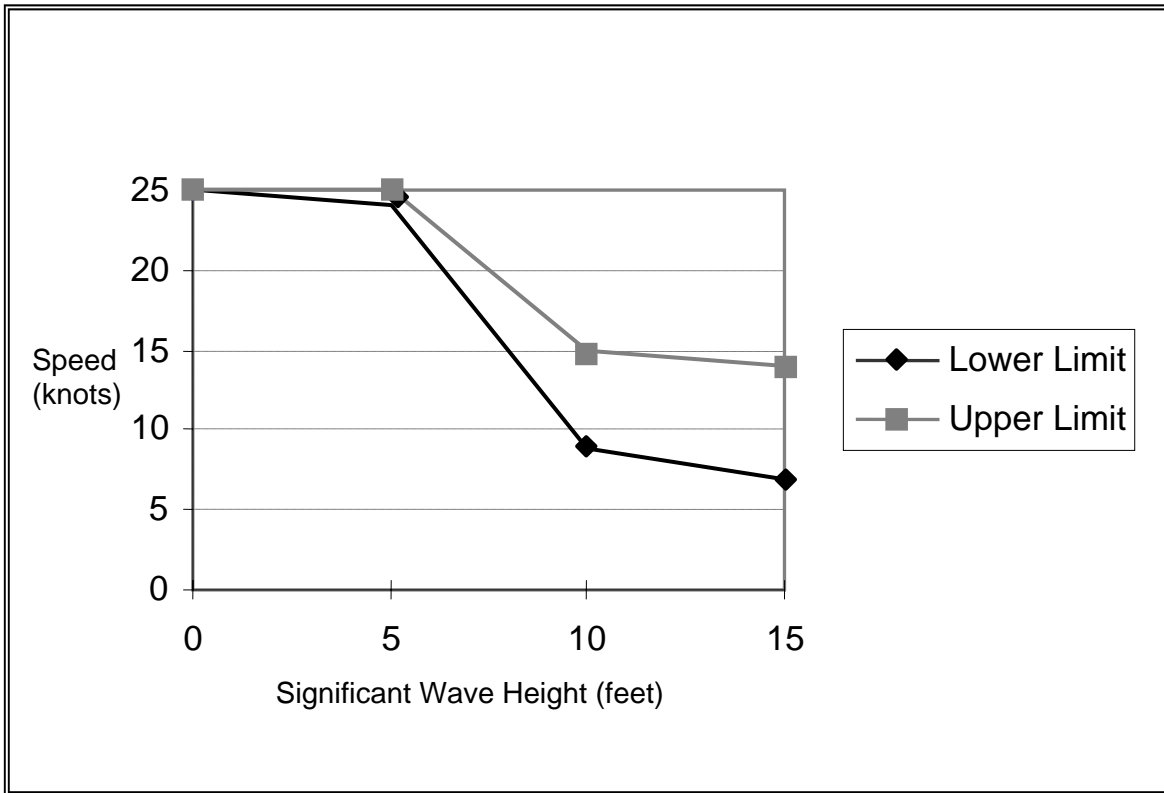


Figure 5-3
Speed vs. Sea Height (Head Seas)

Initial Speed (knots)	Rudder Position (deg)	Time 90 deg (sec)	Time 180 deg (sec)	Time 360 deg (sec)	Tactical Diameter (yards)	Advance at 90 deg (yards)	Transfer at 90 deg (yards)	Turn Speed (knots)
10	20	20	35	62	93	70	57	10
10	30	14	22	44	68	53	37	9
15	20	19	32	58	130	110	82	13
15	30	15	26	47	82	68	46	10
20	20	18	34	61	175	118	94	16
20	30	16	26	45	112	120	64	13
24	30	9	23	44	128	83	37	13

Figure 5-4
Turning Characteristics



**B.5.
Acceleration**

The average minimum time for the 47FT MLB to accelerate to full speed is 40 seconds, covering a distance of 0.2 nautical miles.

NOTE 

Do not use rapid accelerations from DIW to full speed except when necessary. This conserves fuel and helps prolong engine life.

B.6. Speed

The boat idles at 5-6 knots and achieves 20 knots with a full load in sea state 2. Its maximum speed is dependent upon weather and sea conditions, hull condition and a variety of mechanical factors, but should reach 25 knots or greater with a full load in sea state 0. *The boat's speed is deceiving. It moves faster than it appears.* Do not focus solely on peripheral activities or other tasks that will take attention from boat operation.

NOTE 

Maximum speed/power should be used only when operationally necessary (e.g., transitioning a surf zone, responding to SAR case, maneuvering, etc.). Under non-urgent conditions, proceed at cruising speed of 1850 RPM or less.

**B.7.
Deceleration**

The design of the 47FT MLB allows it to move swiftly through the water when up on plane. When power is taken off the boat, it will settle rapidly and stop relatively quickly. A coasting deceleration (from full speed to DIW) requires an average of one minute and ten seconds (covering a distance of approximately 400'). In an extreme situation, the boat can be stopped rapidly by reversing the throttles from full ahead to full astern. This “crash stop” deceleration (both throttles astern full) requires an average of nine seconds, covering a distance of approximately 150'. Deceleration can be done slightly faster than even a crash stop by using hard rudder in addition to astern propulsion.

CAUTION!

Use a “crash stop” only when absolutely necessary. Crash stops place significant strain on the propulsion system.



CHAPTER 6

MISSION PERFORMANCE

Introduction

The actions and techniques described in this chapter are products of field experience. They are intended to give boat crew members information on how the 47FT MLB performs and reacts in various mission scenarios. The information is not intended to provide the “only way” to perform an action or complete a mission. Boat crews should use effective communications and teamwork skills along with this general information to adapt their actions to each unique mission scenario.

Information in this section alone does not qualify a crew member. Observe these procedures and apply skills developed through practice to effectively use the 47FT MLB to perform missions.

In this Chapter

This chapter contains these following sections:

Section	Topic	See Page
A	Starting Procedures	6-3
B	Underway	6-7
C	Handling Characteristics	6-9
D	Surf Operations	6-17
E	Towing	6-19
F	Anchoring	6-23
G	Helicopter Operations	6-25
H	Personnel Recovery	6-27
I	Ice Conditions	6-29
J	Securing Procedures	6-31





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Section A. Starting Procedures

A.1. Pre-Start

The following procedures must be followed before starting a cold engine and should be repeated before each mission. A copy of the starting procedures shall be posted on the Survivors compartment sink, inboard, forward of the mounted flashlight.

Step	Action
1	Inspect bilges for excessive amounts of water. Look for signs of spilled fuel or oils. Pump and clean as necessary.
2	Sound fuel oil tank. Ensure fuel oil is maintained at 95% (373 gallons). Fuel sounding tube is on the aft deck, port side forward.
3	Check the following fluid levels: Engine oil level filled to “FULL” mark. Reduction gear oil filled at least to “FULL” mark. Engine coolant sight glass filled to half mark of coolant recovery bottle. Steering fluid reservoir level at least $\frac{1}{2}$ - $\frac{3}{4}$ full, with a head pressure of 20-30 PSI.
NOTE 	Reduction gear oil will normally be above the “H” mark when the reduction gear is not turning. The reduction gear oil level must be checked again with the engine running at low idle. At low idle, the level must be between the “L” and the “H” marks on the dipstick.
NOTE 	Coolant level must be rechecked after the engine warms up and when the boat stops to take on fuel.
4	Ensure each engine air intake is clear and engine room air damper is open.
5	Ensure exhaust system crossover isolation valve is open.
6	Open sea suction valves and check sea strainers for cleanliness. Ensure sea strainer handle is selected to one side.





Step	Action
7	Energize both engine room start system cutout switches, starboard side of Bulkhead 5 (up position).
8	Ensure fuel shut-off valves are open to fuel tank.
9	Check all belts for proper tension.
10	Secure dockside electrical power and disconnect shore-tie from the boat. Secure all breakers in the 120-volt AC power panel.
11	Ensure HVAC system raw water cooling valve is open if intended to be used.
12	<p>Ensure the main breaker and the following breakers on the 24-volt DC power panel are on:</p> <ul style="list-style-type: none"> DDEC/Ignition Switch (Port) DDEC/Ignition Switch (Starboard) Engine Room Interface Module (2) Engine Starting Engine Alarms/Fuel Gauge Marine Interface Module (Port) Marine Interface Module (Starboard) CO2 System Bilge Alarm Horn Bilge Pump Control Auxiliary Machinery Compartment Lights Engine Room Lights Forward Compartment Lights Enclosed Bridge Lights Console Lights



A.2. Engine Starting



The following procedures must be followed for starting the engines:

Step	Action
1	Set throttle levers to neutral position at all operating stations.
2	Energize the “ENGINE START” switches on the overhead console of the Enclosed Bridge. Energize the DDEC Ignition Switch on the center console forward of the throttles. The EDM should illuminate and sound a brief audible alarm while running system and wiring checks. A display of current engine status follows.
3	Depress and hold the “engine start” button on the Enclosed Bridge console until the engine is started. The engine will idle at 600 RPM. Ensure lube oil pressure is above 5 PSI as indicated on the EDM.
<p>NOTE  If the start system batteries will not crank over the engines, energize the battery parallel switch.</p>	
4	Repeat the previous step for the second engine.
5	Ensure raw water flow through the engines by observing overboard discharge.
6	Visually check the gauges in the engine room for proper operation and operating ranges.
<p>CAUTION!  If proper oil pressure is not evident, immediately secure engine and investigate.</p>	
7	After idling for a two to three minute period, run the engines up to 100 RMP no-load to allow pressures and temperatures to achieve normal operating range, as per Appendix F and 47FT MLB PMS Manual, Tech Pub 3343A; MPC A-D-3353.



**A.3.
Energizing
Equipment**

Complete the following steps prior to getting underway:

Step	Action
1	Energize all of the remaining breakers on the 24-volt DC and 12-volt DC power panels.
2	Energize and test all installed electronic components.
3	Test all jog levers and the helm. Ensure stop to stop movement on the rudder angle indicator.
4	When engines have warmed up (Jacket Water (J/W) and temperature is at least 140°F, and with the throttle levers in neutral, press the “STATION ACTIVE” button on throttle control panel and release. This activates the system control for that helm position. The red “STATION ACTIVE” light should illuminate. The EDM should also display which station has control.
5	Test no-load throttle operation (2200 RPM) in forward and reverse. Test Reduction Gear engagement in forward and reverse at idle.
<p>NOTE </p> <p>NOTE </p>	<p>The “STATION ACTIVE” light will flash during station transfer if the throttle position at the new station is not matched to the old station.</p>
	<p>Depressing and holding the “STATION ACTIVE” button for more than one second disables all control stations; gearboxes return to neutral and engines return to idle. To regain control, place the throttle levers in the neutral position and momentarily depress the “STATION ACTIVE” button again.</p>
6	Repeat steps 4 and 5 at each helm control station.
7	Ensure gear is properly stowed and watertight integrity is set.
8	Inform coxswain on the status of all engineering and electronic systems and if the boat is ready to get underway.



Section B. Underway

Introduction

After getting underway, observe all appropriate machinery gauges. If an abnormal condition develops, take corrective action to prevent further damage. Refer to the Casualty Control section of this handbook, the Boat Engineer Qualification Guide in the U.S. Coast Guard Boat Operations and Training (BOAT) Manual Volume II, COMDTINST M16114.33 (series), or the appropriate manufacturer's technical publication.

B.1. Personal Protective Gear

Always observe requirements of this handbook, the U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series), and the Rescue and Survival Systems Manual, COMDTINST M10470.10 (series) for wearing protective clothing, personal flotation devices, and boat crew survival vests. Personal protective gear is especially important when operating the boat from the Open Bridge in cold and wet weather.

B.2. Communication

Crew communications and coordination are the key to safe operations. Crew members should inform the coxswain of their location when moving about the deck. Engine noise can make crew communications difficult on the 47FT MLB; speak loudly and clearly, repeating as necessary until acknowledged.

NOTE

When operating in surf conditions, effective crew communications are critical. Speak loud enough to be heard over the background noise. Ensure the receiver hears and understands the message being passed. A common strategy is to have the receiver repeat back the message that was sent.


NOTE

The Enclosed Bridge can create a sense of isolation from the elements and other marine traffic. Crew members should use all available means to maintain awareness of wave action, winds, currents and traffic.



B.3. Changing Control Stations

The following are the steps necessary to change control stations aboard the 47FT MLB:

Step	Action
1	Proceed to the new control station and press the <i>helm</i> activate button to take control of steering from that station.
2	Once steering is positively gained and you are ready to transfer throttle control to the new station, match the throttle levers of the new station to the forward or reverse <i>detent clutch position</i> of the currently active station. <i>Do not position the levers above the idle speed position.</i>
3	Press the “Station Active” button at the new control station. The red LED light for that station will begin to flash.
NOTE 	<div style="border: 2px solid black; padding: 5px;"> <p>You have five seconds to complete the procedure once you press the “Station Active” button. If you don’t complete the procedure in the allotted time, the engines will begin to slowly drop in RPM to alert you to complete the throttle match at the new station.</p> </div>
4	Move the throttles out of the detent position to the engine speed of the previous station. Once you match or pass the previous setting, you have assumed control.
CAUTION!	<div style="border: 2px solid black; padding: 5px;"> <p>If the throttle levers at the new control station are not matched for the <i>clutch direction</i> when you press the “Station Active” button, the controls will go to neutral and idle immediately upon pressing the “Station Active” button. This will result in a very sudden loss of boat speed.</p> </div>



Section C. Handling Characteristics

Introduction Boat handling is a complex skill that requires extensive knowledge and practical underway experience to build confidence and skill levels. Properly handling a 47FT MLB requires forethought and finesse. Always know the boat's handling features, monitor the prevailing weather conditions, and take into account the vessel's limiting factors.

In this Section This section contains the following information.

Topic	See Page
Turning and Pivoting	6-10
Head Seas	6-12
Stern to Seas	6-13
Beam Seas	6-14
Effects of Wind	6-15
Station Keeping	6-16



Turning and Pivoting

Introduction

There is a momentary (1½–2½ second) delay in response when inputting DDEC throttle commands. The 47FT MLB turns or pivots, for steering purposes, on its vertical axis at approximately the windscreen. Since the 47FT MLB has a large superstructure and deep-V hull, it turns relatively slowly, especially in strong winds. Because of this design characteristic (which provides other benefits such as straight-line tracking and planning), coxswains must be aware of the boat's turning characteristics.

C.1. Jog Levers

The boat can be steered using the helm or jog levers for rudder commands, by engines, or by the use of environmental factors (wind, current or waves). The jog levers provide a very responsive method of steering. The angle at which the operator moves the jog lever side to side corresponds to the angle at which the rudder will be. Upon releasing the jog lever, it will return to the straight up position and the rudder will return to amidships. Placing a forearm on the chair armrest with the jog lever between middle finger and ring finger gives the operator a good feel for rudder position without looking at the lever itself. For more precise rudder control during maneuvering, use the helm. Use the autopilot for steady course keeping in transit.

NOTE

The jog levers may be used for any boat evolution, but be aware that they do not provide backup manual steering as does the helm.

C.2. Split Throttle Turn

Making fast and effective turns requires knowledge of the boat's capabilities and skill in handling. A full power, full rudder, 180-degree turn takes over 20 seconds to complete, as seen in **Figure 5-4**. For this reason, splitting the throttles and pivoting may be your preferred method in certain conditions. The technique for performing this split throttle turn is outlined on the next page.

CAUTION!

The steps described in the "split throttle" turn are designed to achieve a faster turning speed while reducing the wear and tear on the entire propulsion system. This maneuver should only be used in the most extreme of circumstances.



Step	Action
1	Assume the boat is traveling forward at maximum RPM and a turn to port is going to be executed.
2	Pull the port throttle back to forward detent position while shifting the rudder to full port.
3	Watch RPM indicator for the port engine. When it has dropped to 700 RPM, with a slow and steady motion shift the port throttle through neutral, without pausing, to the reverse detent. After the engine has engaged, apply reverse power as required.
4	As the bow swings through the turn and is approximately 30 degrees from completing the turn, begin shifting the rudder to amidships and return the port throttle to ahead as required. This maneuver should take less than 15 seconds.

C.3. Restricted Maneuvering

In restricted maneuvering, some operators choose to use only the throttles, leaving the rudders amidships. This technique can work well, but operators should be familiar with combined rudder and propulsion techniques, which may be required in high wind situations or with vessels alongside.



Head seas

Introduction

The primary considerations when advancing in head seas are to maintain forward momentum and keep the bow into the swell. The sturdy and buoyant construction of the boat allows it to ride up over oncoming seas.

C.4. Speed

The boat rides well at full speed in open head seas up to 6'. Head seas over 6' may require that the speed be reduced, as necessary, to soften the ride. Increased sea states may dictate further speed reductions for the benefit of crew safety. Relatively smaller, but steeper seas (steep chop) may require that the speed be reduced in lesser sea states. Large open ocean ground swells typically pose no problem, however, and speeds can be increased and adjusted to accommodate crew comfort. The coxswain must find a safe and comfortable speed, keep both propellers in the water, and avoid burying the bow in a wave.

WARNING

In large and cresting head seas, apply only enough power to climb face of wave. Excessive power can cause the boat to become airborne as it exits the wave, resulting in a violent slam.

NOTE

A feature of the control system of the 47FT MLB allows the coxswain to control both engines with one throttle handle. With this feature enabled, the control system automatically synchronizes the RPMs for both engines, allowing the coxswain to constantly adjust speed for wave action without concern for balancing engine speed. *This feature should not be used while in a heavy weather or surf zone or in confined areas.*

C.5. Quartering the Seas

Taking larger head seas slightly off of either bow can create a more comfortable ride, as the boat may proceed more gently off the back of the wave instead of slamming violently. The speed and angle of approach will have to be adjusted as needed for the optimum ride. This is sometimes referred to as quartering the seas, which is not to be confused with taking a following sea on the quarter.



Stern to Seas

Introduction Following open seas up to 10' can be negotiated at full speed as long as the boat remains stable as it travels down the front of the swell. Following seas over 10' may require a reduction in speed to maintain stability and avoid injury to the crew.

WARNING 

While operating the 47FT MLB stern to the seas >6' and RPMs >1800, the boat is prone to being *caught on the hardchine*. Being *caught on the hardchine* is best described as the boat suddenly heeling over 50-80 degrees on a false keel. The coxswain's corrective action shall be to immediately reduce power to return the boat onto the true keel.

C.6. Using the Stern for Alternative Options

With the majority of the weight aft and seven feet of freeboard, the stern is a stable and protected platform in seas up to 12' and surf up to 8-10'. Low RPM and split throttle maneuvering techniques work well to shift the stern in the desired direction. This capability offers alternative "stern-to" station keeping and tow approach options.

C.7. Riding the Back of a Wave

Inbound in breaking waves over 10', position the boat on the back of a wave and adjust the speed so the boat will ride in on the back of the wave. While riding on the back of a wave in heavy weather, monitor the boat's speed closely to avoid overtaking the wave as its speed toward shore decreases.

WARNING 

The 47FT MLB's speed often allows the coxswain to position the boat on the back of an incoming wave. Take care not to position the boat too high on the back of the wave as this is the part of the wave that quickly gains speed and plunges as it breaks. If the boat is too high or too fast, the boat may go over the face of the wave as it breaks.

WARNING 

Despite its speed, it is possible for the 47FT MLB to be overtaken by waves under certain conditions. Pay close attention to wave activity astern of the boat when proceeding inbound on breaking waves.



Beam Seas

C.8. Steering

Whenever possible, the coxswain should avoid steering a course parallel (broadside) to heavy swells. Tack across the swells at an angle (30 to 40 degrees). If necessary, steer a zigzag course, making each leg as long as possible, and adjust the boat speed for a safe and comfortable ride. Seas directly off the beam of the boat can cause adverse rolling conditions.

When transiting parallel to the seas, the boat will tend to ride the contour of the wave surface. This means that the boat's vertical axis will remain perpendicular to the surface on which the boat is operated. A wave face of 20 degrees will cause a 20-degree heel.



Effects of Wind

C.9. Turning the Bow

In calm or negligible wind and seas, the 47FT MLB responds well using standard twin screw operating practices. In stiff winds, several design features combine to make handling this boat challenging. With the majority of weight and the deepest draft aft, the bow is very susceptible to the effects of the wind. Winds exceeding 25 knots have a dramatic effect on maneuverability and can often be the predominant environmental factor in maneuvering situations. In winds exceeding 30 knots, it can be difficult to recover and turn the bow into the wind at slow speeds (station keeping, towing approaches). Spilling whitecaps may combine with the wind to compound this problem, as they too will push the bow around. When towing, the bow becomes even more susceptible to the effects of the wind as the towed vessel tends to hold the stern down.

C.9.a. Restricted maneuvering

In restricted maneuvering situations (alongside, at marinas, piers, wharves, etc.), analyzing the environmental conditions and using them to help rather than hinder operations is the way to deal with the large sail area created by the bow and superstructure.

C.9.b. Towing in winds

Bow into weather towing approaches become very difficult if the wind exceeds 30 knots. Once the wind catches the bow, it can be difficult to turn the bow back up into wind while station keeping. Stern-to approaches in small swell conditions often solve this problem.



Station Keeping

C.10. General Station keeping in both surf and open water requires concentration to maintain a constant heading and position. The boat tends to work well with its stern to the wind as the bow tends to “weathervane” downwind. If stern-to station keeping is not an option, the operator must use extra care to counteract environmental factors.



Section D. Surf Operations

Introduction

Surf or bar conditions require constant attention by the coxswain. The coxswain should not rely solely on the boat's speed to outrun a wave nor rely on its excellent survivability to withstand a large wave. In surf, the boat can become airborne very easily. Although the 47FT MLB is designed to operate in surf, breaker avoidance is the preferred practice in most situations. You may also view online training on the National Motor Lifeboat's website: <http://www.uscg.mil/hq/g-o/nmlbs/>.

D.1. Recognizing a Wave

The height of eye (about 14') from the Open Steering Station may give the false impression that wave height is less than it actually is. If you are in a trough and are directly level with the crest of a wave, the wave is approximately 14' tall; anything less can look especially small. As has been previously experienced, under the right conditions, a 10' breaking wave can roll the 47FT MLB.

D.2. Outbound in Waves Under 14'

Use the minimum amount of power required to keep the bow heading into the wave. Excessive power will produce speed, which can launch the boat off the back of the wave resulting in a hard landing that may damage the boat or cause injury to the crew. In surf, slight forward momentum is recommended when breakers are encountered. The amount of momentum will vary depending on the speed and size of the breaker. Square to the seas with the bow pointed toward any breaking wave. The use of throttles with generous amounts of power may be necessary to maintain optimum direction. This is critical to maintain the desired direction of approach.

D.3. Outbound in Waves Over 14'

It may be necessary to apply power to push the boat over the top of the wave. Apply only enough power to climb the face and push the bow over the top; too much power will result in a launch as previously described. Wind on or leeward of the beam when climbing steep faces may also blow the bow around as the boat goes over the top of the wave. Strong wind (>20 knots) requires constant attention to keep the bow oriented toward the surf.

CAUTION!

When climbing the face of steep waves, the boat's forward buoyancy causes it to assume a substantial bow-up attitude creating a sensation that the boat is vertical and that it may "reverse pitch-pole". This may result in an urge to apply excess power. This urge must be suppressed to avoid launching off the back of the wave.



D.4. Inbound

When overtaking waves in a surf zone or steep open water seas, there is a tendency to lose rudder control as the boat pushes over and starts down the face of a wave. The bow may veer off and rudder control may be reduced to a minimum. This is often easily solved by a power reduction on the outboard shaft. If not, power reduction on both shafts may be necessary to regain control.

D.5. Stern to Station Keeping

When station keeping in surf up to 6', applying approximately 1000 RPM astern for 1-2 seconds will keep the boat from surging forward as the wave passes. Surging breakers up to 10', or spilling white water generated by breakers up to 10', can be taken on the stern as the water shoots straight up and passes around the stern. Again, a brief application of astern power will help to maintain position. It is important to gain sternway prior to being struck by the surf on the stern. In the event surf larger than 10' must be taken on the stern, significant and higher engine RPM will be needed (meet power with power).



Section E. Towing

Introduction

The 47FT MLB has enough power and the right equipment to handle any emergency towing job likely encountered. The coxswain should consider all factors concerning weather, sea state, distance to tow, and size of vessel before attempting each tow. General towing limitations are set at 150 displacement tons. Under particularly favorable conditions, the boat may be safely able to tow vessels up to 200 tons with permission from the Operational Commander.

CAUTION!

During normal operation, engines should not overload for more than a few seconds, if at all. Continually overloading the engines and/or overriding the DDEC system significantly shortens engine service life.

NOTE *℘*

The DDEC control system is equipped with an engine overload protection feature which allows the coxswain to exceed the maximum power curve for a set period of time. Temporary overloading of the engines may occur during surf operations, towing evolutions, and single engine operations.

When the engine(s) have been in an overload condition for more than one minute, the EDM(s) will give an audible alarm and display “Code 410, Overload Warning.” This warning will be displayed for two minutes. If no action is taken for two minutes, the EDM(s) will then display “Code 58, Torque Overload,” and the engine output will automatically ramp down to the maximum allowed power curve.

If operations necessitate, the coxswain may override this automatic ramp down by pressing and releasing the “Overload” button on the station control panel. This can be pressed anytime during an overload situation and will allow an additional two minutes of operation above the maximum power curve.

E.1. Approaches

The prevailing winds and seas can greatly affect the ability to safely approach and take another vessel in tow.



E.1.a. Bow to the wind

The “traditional” bow into the prevailing conditions towing approach is not always the most effective. When approaching and station keeping with the bow into the seas, the coxswain must be aware of a “see-saw” effect, which greatly affects crew performance on the fantail. As the 47FT MLB climbs the front of a swell and as the swell passes under the boat, the boat “see-saws” or pivots just aft of the recovery well. This has a catapult effect on crew trying to work on the aft deck.

In addition, bow into the weather towing approaches become very difficult if the wind exceeds 30 kts. Once the wind catches the bow, it is nearly impossible to turn the bow back up into the wind while station keeping. This problem is compounded if large whitecaps are spilling off the seas, as they will further push the bow off.

E.1.b. Stern to the wind

Down swell, stern to the wind and seas towing approaches have proved to be very effective in conditions up to at least 10'. With a majority of its weight aft and nearly seven feet of freeboard at the transom, 47FT MLBs can effectively take seas on the stern while providing a stable and protected platform for crew work. In addition, with the stern to the wind, the bow tends to “weathervane” downwind, making it easier to maintain station while taking a vessel in tow.

E.1.c. Safe zone optimal position

In both the bow to and stern to the prevailing condition approaches, the most successful method of taking the vessel in tow is to station keep with the towline worked off the beam.

NOTE 

Attaching a towline to the bow eye of a small boat is difficult from a 47FT MLB. The stern is too high, and when attempted from the recovery well, escape routes are limited if the two vessels were to strike together.

E.2. Affects of Wind with Vessel in Tow

The coxswain should be aware of the additional effect the wind may have on the 47FT MLB with another vessel in tow. The aft tow bitt tends to hold the stern down, further enhancing the effect of wind on the bow. In addition, the coxswain should be aware of substantially increased fuel usage with a large vessel in tow.



**E.3. Tow
Watch**

The tow watch should be extremely vigilant in observing the condition and ride of the tow, especially when the coxswain has retreated to the enclosed steering station. When towing vessels lower than the 47FT MLB transom, or when towing with a long towline, chafing can occur along the transom. The tow watch should closely monitor this and react as necessary.

CAUTION!

The towline reel motor is to be used strictly to aid in stowage of the towline. Recovery of the towline from the water should be done by hand. Once the towline is on deck, two crew members can easily and quickly stow the line back on the reel. One crew member should feed the reel while the other should operate the power button.



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Section F. Anchoring

Introduction

The 47FT MLB does not often drop anchor. However, the boat is fitted with an anchoring system designed for use when the boat must stand by a location or in an emergency.

F.1. Anchoring the Boat

The port deck locker contains a 19-lb Fortress anchor, 9' of $\frac{3}{8}$ " stainless chain and 300' of $2\frac{1}{4}$ " DBN.

Take the following steps to safely anchor the boat:

Step	Action
1	Fair-lead the bight of the anchor line outboard of all deck fittings on the port side. Pass the line through the open bullnose, take all slack out of the line, and take it to the forward tow bit with one round turn.
2	While one crew member tends the anchor line at the forward bitt and as directed by the coxswain, release the pin securing the anchor in the port forward deck locker and remove the anchor from the bracket.
3	As directed by the coxswain, the anchor should be dropped over the side well clear of the boat.
4	Once the anchor is tending "up and down", the coxswain should back down until the desired amount of scope is attained and the anchor line is secured.



F.2. Weigh Anchor

Take the following steps to safely weigh anchor:

Step	Action
1	Position one crew member at the bitt and one between the bitt and the bullnose. As the coxswain moves the boat slowly forward, the forward crew members take up the slack in the line while maintaining one round turn at the bitt.
2	Once the anchor is at “short stay”, the anchor line should be secured at the forward bitt.
3	Crew members can then attempt to break the anchor free from the bottom. If unable to do so, the coxswain should move the boat slowly forward until the anchor breaks free.
4	Once free, crew members can pull the remaining anchor line and the anchor on board.
5	When the anchor is aboard, the coxswain should take up a stable course so that the crew members can stow the anchor and ground tackle in the port storage locker.



Section G. Helicopter Operations

G.1. Hoist Working Area

The 47FT MLB provides a stable platform for helicopter hoists; however, several design factors are worthy of consideration. First, the aft location of the boat's mast makes for a small working area in which the helicopter and boat crew can work from. The trail line method is often the safest way to conduct the hoist. Secondly, noise from the helicopter makes radio communications difficult from the Open Bridge.

G.2. Crew Placement

A common crew placement strategy is to have two crew members on the stern to work the hoist. A third crew member remains on the Open Bridge as safety observer and communicates via hand signals with the coxswain who controls the boat's course and speed from either the Open Bridge or the Enclosed Bridge. From the Open Bridge, it is easier for the coxswain to monitor the progress of the hoist, while from the Enclosed Bridge, it is easier to maintain communication with the helicopter while steering the boat on the assigned heading. The problems with both options must be considered by the coxswain in making a risk management decision.

G.3. Procedures

Detailed procedures and instructions on helicopter operations are contained in the Boat Crew Seamanship Manual, COMDTINST M16114.5 (series).

CAUTION!

Crews conducting trail line hoist evolutions must tend the trail line at all times. The design of the aft deck will not contain slack line if loose on the deck. This may result in the trail line fouling the 47FT MLB's propellers or shafts if it goes over the side.



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Section H. Personnel Recovery

H.1. Pick-Up Ports

The port and starboard deck recesses or “pick-up ports” are designed to allow for recovery of personnel in the water despite the 47FT MLB’s high freeboard. The side recess grating is capable of supporting two (2) crew members under a force of 3 g’s. The grating hinges against the side of the deckhouse; two locking pins retain the grating in the up or down position. Only one person is necessary to raise or lower the deck grating, but it is faster and safer if two persons are used.

NOTE

Gratings should be secured in the up position prior to heavy weather and/or surf operations so that the boat is ready for PIW recovery.

H.2. Controlling the Boat

From the Open Bridge, the coxswain can use either port or starboard steering station to control the boat during recovery of personnel in the water. This affords the coxswain excellent visibility during the approach as well as during the recovery efforts in the deck recess.

H.3. Deck Recess

There are several D-ring attachment points in the vicinity of the deck recess that allow crew members to clip in while conducting personnel recovery. Crew members should be aware that movement is limited within the deck recess area and that moving the victim once aboard may be difficult.

CAUTION!

During personnel recovery efforts in heavy weather or surf conditions, the deck recess is extremely vulnerable to wave action.



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Section I. Ice Conditions

I.1. General

The 47FT MLB is not designed to break ice and should avoid operations in this capacity if at all possible. The 47FT MLB can, however, operate through light surface ice if necessary to reach open water. Do not exceed 1000 RPM when operating in ice conditions. In slush conditions, ensure that the sea water cooling system is checked regularly to ensure clogging has not occurred. Operations at high speed (during cold weather) will increase the likelihood of topside icing due to freezing spray.

WARNING

Excessive topside icing will greatly affect the boat's stability and righting arm. ANY topside icing should be cause for the coxswain to re-evaluate the conditions and re-assess the risks involved in the mission. The boat is technically capable of survival with up to ¾" of ice covering the entire boat in heavy weather with expert boat handling. Operation with topside icing should only be attempted during extreme emergencies after proper risk assessment and approval from the operational commander.

NOTE

Be aware that freezing spray may seal hatches and scuttles, thus limiting immediate or emergency access (i.e. aft deck box stowage). Recovery recess gratings may become iced in place. Prudent operations under these conditions may be to run with the port grating down (for safe access to the forward deck) and the starboard grating up (for PIW recovery).





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Section J. Securing Procedures

J.1. Procedure The following procedures should be repeated after each mission:

Step	Action
1	Secure all electrical and electronic components on the Open Steering Station.
2	Secure all electrical and electronic components in the Enclosed Steering Station.
3	Secure engines using push buttons in the Enclosed Steering Station.
4	Secure start system cutout switches in the Enclosed Steering Station overhead console and DDEC ignition switch.
5	Install shore-tie cable to the boat; energize dock side shore power.
6	Energize equipment breakers in the 120-volt AC power panel Auxiliary Machinery Compartment. Ensure battery charger is operating normally.
7	Secure Engine Alarm/Fuel Gauge breaker on the 24-volt power panel in the Auxiliary Machinery Compartment.
8	Secure Tri-data and Autopilot breakers on the 12-volt power panel in the Auxiliary Machinery Compartment.
9	Secure HVAC cooling system valve in the Auxiliary Machinery Compartment starboard side.
10	Secure sea suction valves for the engines under the ladder in the engine room.
11	Secure both engine room start system cutout switches.
12	Check all machinery fluid levels and refill as necessary.
NOTE 	It may be necessary to wait 30 minutes to obtain an accurate reading on engine lube oil levels.
WARNING 	Do not check engine coolant levels until temperature has dropped to 160 degrees or below (temperature gauge in engine room overhead.)



Step	Action
13	Conduct a visual inspection of the engine room and machinery spaces and their bilges for any obvious abnormalities.
14	Clean engine room bilges and machinery.
15	Sound fuel oil tank and refill to 95% (373 gallons).
16	Secure all watertight doors, hatches and covers.
17	Wash the boat down with fresh water.
NOTE 	Keeping the boat clean and neat is very important to control corrosion. Having aluminum in contact with dissimilar metal, particularly a copper alloy, can cause major corrosion problems. Something as small as a penny left in the bilge can cause serious corrosion. Maintaining corrosion control is the responsibility of everyone in the crew.



CHAPTER 7

EMERGENCY PROCEDURES

Introduction

Responding to emergencies and equipment casualties aboard the 47FT MLB should be second nature to all members of the crew. The ability of crew members to take immediate action to control emergency situations is critical to prevent a bad situation from getting worse. While every event is different, step-by-step procedures help gain control of the casualty and aid in troubleshooting.

The first step in all casualties is to protect the immediate safety of all crew members and to establish communication amongst the crew as to the nature of the casualty. It is the coxswain's responsibility to keep the station informed of all emergencies encountered during the operation of the boat.

The coxswain and engineer should work together to determine if equipment casualties can be safely repaired while underway. The coxswain must decide whether a casualty has impacted the ability of the boat and crew to complete the mission. The coxswain should not make the decision in a vacuum; input from other crew members, especially the engineer, as well as communication with shore side personnel should be used to determine whether to continue with the mission. The following factors should be considered:

	Factors
1	The safety and physical condition of the crew and vessel
2	Equipment limitations due to the casualty
3	Current and forecast weather and sea conditions
4	The urgency of the mission



In this Chapter This chapter contains the following sections:

Section	Topic	See Page
A	Capsizing	7-3
B	Collision with Submerged Object (or Bottom)	7-5
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C.II	Steering Casualty (Electrical)	7-9
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Section A. Capsizing

A.1. Preparation

Any surface activity big enough to roll the boat will bring it right back up. If the 47FT MLB lower gunwale digs into the trough, prepare to roll over. Take a deep breath and hang on. Average time under water will be approximately 8 to 12 seconds. Although the boat was built to withstand a roll over, there may be damage.

A.2. Recovery

Once righted, assess the situation quickly. You will still be in the surf and must take immediate action to take the next wave correctly or the boat may roll again. Check the crew to ensure no one was lost overboard or injured. Check for lines overboard that might get caught in the propellers. If the engines are still working, move to safe water.

NOTE

It may be necessary to re-qualify the throttles to gain control of engines and reduction gears.

A.3. Actions




Once in safe water, take the following actions:

Step	Action
1	The boat engineer will go below to check for damage.
2	Investigate the condition of the engine room by looking through the window in the watertight door. The engine room may be coated with water and oil presenting a fire hazard.
3	Begin de-watering the vessel by energizing all of the installed electric bilge pumps. If the flooding is too severe to be handled by the electric bilge pumps, rig the CG-P6 on the aft deck and connect the suction line to the engine room suction standpipe.
4	Once dewatering is complete, check the oil in both main engines (Engines must be secured to ensure an accurate reading). Add oil as necessary.

NOTE

Engines should be shut down to check oil level. If circumstances make securing the engines inappropriate, wait to check the oil levels until the situation has further stabilized. In the meantime, keep a close eye on the engine oil pressure.



Step	Action
5	Closely check the material condition of each compartment. Report results to the coxswain.
6	After damage has been assessed, determine whether it is safe to proceed with the mission or should you return to the unit.
7	Upon returning to the station, all electronic and electrical equipment must be removed and cleaned.
NOTE 	Do not hook up the shore tie. Electronic equipment in all below decks spaces may be soaked with oil and water.
WARNING 	A back up means of communication is critical after a capsizing or knockdown. A portable VHF-FM radio is the best means of passing critical situation reports immediately following this type of situation.
NOTE 	All wiring must be cleaned, dried and inspected. Once complete, all electrical equipment must be tested thoroughly. The engine room must be washed down and all insulation material in the Survivors compartment must be inspected. All fluids and associated filters, such as reduction gear, hydraulic system, and main engine oil should be replaced.




Section B. Collision With Submerged Object (or Bottom)

B.1. Symptom The boat strikes a submerged object or temporarily runs aground.

B.2. Actions Take the following actions:

Step	Action
1	Reduce RPM on both engines to neutral (when in safe water and out of surf zone).
2	Notify crew of casualty.
3	Determine what was hit, where the object is located, and if it can still be seen.
4	Verify current position, depth of water, and evaluate situation.
5	Engineer checks gear space and shaft for obvious flooding or damage.
6	Engineer checks engine room through engine room view port to assess obvious flooding or damage.
7	Engineer enters engine room with crew member as safety observer.
8	Engineer checks engine room bilges for flooding or obvious damage (particularly around the strut mounting points.)
9	Engineer checks lazarette bilges for flooding, rudder or steering system damage.
10	Engineer checks for proper cooling water circulation or debris in the Raw Water (R/W) strainers and shift if necessary.
11	Crew member checks auxiliary and forward compartment bilges for flooding or obvious damage. Assess situation by making observation through door view port before entering the compartment.




Step	Action
12	Crew member checks forepeak void for flooding by removing drain plug at bulkhead.
13	Coxswain conducts steering checks by using the manual helm first to identify limitations or isolate areas of damage, then conduct checks by using the jog levers to insure full steering ability is available.
14	Coxswain will check engine RPM in both neutral and engaged at various speeds while engineer is checking for vibration/flooding and to assess damage to propulsion system. Engineer will be observing for flooding and vibration at marine gear space.
15	Return to station at reduced speed or on one engine, if warranted, to prevent additional damage or vibration.
16	Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or vessel safety will be jeopardized through continued operation.
NOTE 	If possible, the boat should be hoisted to determine extent of damage; especially if there is a vibration.




Section C.I. Steering Casualty (Hydraulic)

C.1. Symptoms The helm turns in either direction with no rudder response (caused by a failure within the hydraulic system). The sounding of the low steering pressure alarm occurs.

C.2. Actions When a partial or complete loss of steering control occurs, take the following actions:

Step	Action
1	Reduce engine RPM to clutch ahead.
2	Secure both engines when low steering pressure alarm on console sounds.
NOTE 	If possible, when the low steering alarm sounds, attempt to center the rudders prior to securing both engines.
3	Notify crew of casualty.
4	Verify current position, evaluate situation and contact station.
5	Crew member rigs the anchor for emergency use (fair-lead line, but anchor remains in bracket) if directed by coxswain.
6	Engineer checks engine room through engine room view port to assess the situation.
7	Engineer enters engine room with crew member as a safety observer.
8	Check bilges and look for obvious leaks.



Step	Action
9	Check gauge on reservoir for pressure. If there is no hydraulic oil or pressure, both engines remain secured. Reservoir system gauge should read 20–30 PSI. Power system gauge should read 150–250 PSI (only if engines are running). Reservoir level should be ½–¾ full.
<p>WARNING  There is a steering pump attached to each engine. This will allow the coxswain to steer the boat with only one engine running. The helm unit will work only if there is fluid in the system. The steering pump will be destroyed and possibly cause engine damage if either engine is run with no fluid in the power steering system!</p>	
10	Check remainder of steering system from the steering rams in the lazarette to the helm station on the Open Bridge.
11	Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or vessel safety will be jeopardized through continued operations.
12	Engineer and coxswain discuss option of removing the sun gear from “both” hydraulic pumps before restarting engines in order to gain use of engines for maneuvering.



Section C.II. Steering Casualty (Electrical)

C.3. Symptoms The jog lever has no rudder response or is not responding correctly, or the autopilot is controlling vessel steering, but is not responding correctly.

No low steering pressure alarm accompanies this system. When checked, the hydraulic portion of the steering system is intact, full, and has the proper head pressure.

C.4. Actions When a partial or complete loss of electrical steering control occurs, take the following actions:

Step	Action
1	Reduce engine RPM to clutch ahead.
2	Notify crew of casualty.
3	Attempt to select steering station; reactivate jog lever control. Check to ensure autopilot is disengaged. Determine what function autopilot is in (auto/nav/power system).
4	Shift steering control to hydraulic helm. Bring engines to neutral if electro-hydraulic side of steering system continues to affect hydraulic helm control. Establish vessel control and maneuver to safe waters.
5	Verify current position, evaluate situation and contact station.
6	Crew member rigs the anchor for emergency use (fair-lead line, but anchor remains in bracket) if directed by coxswain.
7	Engineer checks engine room through engine room view port to assess the situation.
8	Engineer enters engine room with crew member as a safety observer.
9	Check bilges and look for obvious leaks.
10	Check gauge on reservoir for pressure. If there is no hydraulic oil or pressure, both engines remain secured. Reservoir system gauge should read 20–30 PSI. Power system gauge should read 150–250 PSI (only if engines are running). Reservoir level should be $\frac{1}{2}$ – $\frac{3}{4}$ full.



Step	Action
11	Check electrical connections at electro-hydraulic steering valve (steering control solenoid actuator).
12	Check power servo cylinder (steering ram) connections and autopilot rudder angle indicator connections in lazarette.
13	Check steering system breakers in Auxiliary Machinery Compartment.
14	Secure steering control breaker if faulty jag lever continues to interfere with hydraulic helm. Secure autopilot breaker if autopilot continues to interfere with hydraulic helm.
15	Coxswain coordinate with Station for tow or other assistance when risk assessment indicates crew or vessel safety will be jeopardized through continued operation.





Section D. Reduction Gear Failure

D.1. Symptoms One or both Reduction Gear(s) (R/G) fail to respond properly when the throttles are operated in forward or reverse.

D.2. Actions Take the following actions:

Step	Action
1	Bring the throttles back to neutral.
2	Notify the crew.
3	Verify current position, evaluate situation and notify station of status.
4	Coxswain checks EDM for R/G pressures and secure engine if pressure is not within parameter. (Disengaged pressure is 58-66 PSI and engaged pressure is 230-290 PSI.)
5	Insure active light is lit at control station.
6	Coxswain attempt to regain R/G control by changing to another throttle station or engaging back up panel.
7	Coxswain secure affected engine.
8	Crew member rigs the anchor for emergency use (fair-lead line, but anchor remains in bracket) if directed by coxswain.
9	Engineer checks both EGIM breakers on 24-volt power panel.
10	Engineer checks the affected R/G L/O level and bilge for oil.
11	Check R/G DCV electrical connections.
12	Engineer checks dirty oil filter indicator located on duplex strainer. If indicator has popped up, handle shall be shifted to the opposite strainer.
13	If no leaks are present and oil level is full, restart engine and recheck clutch applied pressure. Secure engine if pressure is not within parameters.



Step	Action
14	After all mechanical checks have been made, proceed to troubleshoot electronic controls (DDEC).
NOTE 	<div style="border: 1px solid black; padding: 5px;"> In the event of reduction gear electronic control failure, the reduction gear control valve can be operated manually by pushing in on the pin located at the solenoid end cap and locked into position by inserting the locking pin into the hole at the top of the end cap. </div>
15	Manually operate DCV if failure of the electronic controls was determined.
16	Coxswain and engineer discuss using the come home device.
NOTE 	<div style="border: 1px solid black; padding: 5px;"> If a long distance must be traveled to return to a station, each reduction gear is fitted with a “Come Home” device that can lock the forward clutch packs together for operation. </div>




Section E. Fire in the Engine Room

E.1. Symptoms The engine room fire alarm system sounds because engine room temperature exceeds 190°F.

The engine room fire alarm system sounds because of smoke and debris.

E.2. Actions When the engine room fire alarm sounds, take the following actions:

Step	Action
1	Reduce RPMs of both engines to neutral.
2	Notify crew of casualty and account for all personnel on board.
3	Engineer checks engine room through engine room view port to assess situation.
4	Coxswain secure both engines with engine stops at local steering station, verify position and contact station with casualty.
5	Engineer pulls fuel stops in Survivors compartment with coxswain's concurrence.
6	Crew member secures shut off valves for both engine room air inlets located within aft buoyancy chamber.
7	Engineer energizes CO ₂ system by releasing locking pin and depressing handle or by pulling ring locally at CO ₂ bottles.
NOTE 	There is a 30-second delay built into the CO ₂ system. This delay can be manually overridden by pulling the CO ₂ release handle on the delay system mounted on the starboard bulkhead of the Survivors compartment.
8	Engineer secures all non essential electrical power breakers (all except VHF-FM radio) located in the Auxiliary Machinery Compartment with the coxswain's concurrence.
9	Crew member to rig anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the coxswain.
10	Coxswain discusses relocating of CG-P6 portable pump forward away from engine space (ensure pump is secured).



Step	Action
11	Establish fire watch, with portable fire extinguisher readied in Survivors compartment, to monitor by observing through the engine room view port.
12	Coxswain coordinate with station for tow or other assistance, emphasizing crew safety.

WARNING 

It is extremely dangerous to enter a compartment during or after a fire. After the engine room has been flooded with CO₂, extensive ventilation is necessary to ensure safety when entering; however, any introduction of oxygen into the compartment may ignite a fire reflash. Keep the space sealed until moored and secured.



Section F. Fire in the Auxiliary Machinery Compartment

F.1. Symptoms Smoke is observed coming out from the Auxiliary Machinery Compartment vent.

F.2. Actions Take the following actions:

Step	Action
1	The coxswain should secure the engines, inform all crew members and notify the station.
2	The engineer should proceed to the Survivors compartment with a safety observer. View through the auxiliary view port to assess the situation and ensure that all Water Tight Doors (WTD) are secured.
3	Engineer secure battery-disconnect switches on the port FWD bulkhead in Survivors compartment. Safety observer is to establish fire watch with portable fire extinguisher.
4	Crew member to rig anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the coxswain.
5	Keep the Auxiliary Machinery Compartment sealed until moored and secured.
6	Coxswain coordinate with station for tow or other assistance.

WARNING 

It is extremely dangerous to enter a compartment during or after a fire. Do not enter the Auxiliary Machinery Compartment under any circumstances. There is not an installed fire fighting system for this compartment.




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Section G. Loss of Control of Engine RPM

G.1. Symptoms One or both engines fails to respond properly to DDEC throttle station control.

G.2. Actions Identify the cause, prevent further damage, and take the following actions:

Step	Action
1	Place both throttle control levers in clutch ahead position.
2	Notify crew of casualty, verify position and contact station.
3	Coxswain insures throttle station is active and synch function is off.
4	Coxswain shift to another station and attempt to gain throttle control.
5	Use emergency backup panel to gain engine control after checking other throttle stations.
6	Use engine stop button (push and hold down) to secure affected engine.
7	If engine fails to secure, engineer proceeds to Survivors compartment and pulls emergency fuel cutout for affected engine.
8	Engineer enters auxiliary space and secures affected engine's DDEC breaker on the 24-volt power panel.
9	Coxswain uses emergency air shut down if engine still fails to secure.
<p>WARNING  DO NOT use the CO₂ system to secure the engine. Depleting the fire fighting capabilities of the boat can be dangerous.</p>	
10	Once engine is secured, engineer enters engine room and closes exhaust cross-over valve. (See Appendix B: EC-027)



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Section H. Loss of Fuel Oil Pressure

H.1. Symptoms The engine runs rough with a rapid loss of power. The EDM alarm sounds and displays “Code 48, Fuel Oil Pressure Low.”

H.2. Actions Take the following actions:

Step	Action
1	The coxswain should reduce RPMs to clutch ahead, determine which engine has lost power, and inform the crew.
2	Coxswain inform crew of casualty, verify position, evaluate situation and contact station.
3	Crew member to rig anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the coxswain.
4	The engineer should proceed to the engine room, look through the view port to the engine room door, and assess the situation.
5	Engineer enters engine room with crew member as safety observer.
6	Engineer check bilge for fuel oil.
7	Check the emergency fuel cutout valves to ensure that they are open.
8	Check the primary fuel filters for accumulated sediment and water in the bowls. Replace if suspect. Re-prime the system.
9	Check the entire fuel system for obvious leaks; check fuel tank level.
10	Identify and correct source of problem or request additional assistance from station.
11	Coxswain maneuver 47FT MLB safely using one engine if problem was not found. If running on one engine for an extended time (more than 30 minutes), you must close the exhaust cross-over valve.






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Section I. Loss of Lube Oil Pressure

I.1. Symptoms The EDM alarm sounds and displays “Code 45, Oil Pressure Low.”

I.2. Actions Take the following actions:

Step	Action
1	The coxswain should reduce the engines to clutch ahead and determine which engine has loss of lube oil pressure.
NOTE 	The lube oil alarm is variable, which means that at any given engine RPM, the oil pressure must be within a certain range or the alarm will sound. The lube oil alarm may be directly related to engine temperature; an overheating engine may set the lube oil alarm off.
2	Coxswain immediately secure the affected engine, inform the engineer and other crew members of the casualty, verify position and contact station.
3	Crew member to rig anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the coxswain.
4	Engineer proceed to the engine room and look through the view port on the engine room door to ensure that it is safe to enter.
5	If it is safe to enter, crewman, as safety observer, enters the engine room’ and checks the bilge for oil and obvious lube oil leaks.
6	Engineer checks the engine lube oil for quantity and quality.
7	Check the recovery tank for contamination.
8	If the cause is not correctable, do not restart the engine.
9	Return to station on one engine, as necessary, if cause cannot be determined or repaired.
NOTE 	In an emergency, oil pressure can be run as low as 5 PSI at idle and 32 PSI at full load.
NOTE 	If running on one engine for an extended time, you must close exhaust cross-over valve. (See Appendix B: EC-027)




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Section J. Main Engine High Water Temperature

J.1. Symptoms The EDM alarm sounds and flashes a Code 44 (Coolant Temperature High).

J.2. Actions Take the following actions:

Step	Action	
1	Coxswain should reduce both engine's RPM to clutch ahead and determine which engine has overheated.	
2	Coxswain notify crew of casualty, verify position and contact station.	
3	Coxswain secure engine if temp exceeds 212°.	
4	Engineer should proceed to the Survivors compartment, look through the engine room view port, and assess situation.	
5	Engineer enters engine room with crew member as safety observer.	
6	Engineer check engine temperature as indicated on mechanical gauge, check bilges and engine for obvious leaks.	
7	Feel the R/W brass piping to determine what system the casualty is in.	
<p>WARNING  If steam is flowing from the expansion tank vent, the engine(s) should be secured and cooled naturally. If the pressure is released when extremely hot by removing the expansion tank cover, the coolant will either flash to steam or boil with a serious potential for injury.</p>		
8	IF ...	THEN ...
	Pipe is cool	The raw water system for that engine is probably operating normally; the engineer should make initial casualty control checks for the jacket water system.
	Pipe is hot	The engineer should make casualty control checks for the raw water system.



J.3. Raw Water System Checks

Take the following actions to check the function of the raw water system:

Step	Action
1	Verify that the sea suction valve(s) are open. Ensure that the de-icing valves located just under the engine room step are closed.
2	Check the duplex strainers to ensure that the handle is pointing to one strainer or the other. Shift and clean the strainers as necessary.
3	If the strainers are clean, check the raw water pump cover lightly with the back of the hand for coolness. If the impeller is burned up, the cover will be very hot. If the cover is hot, secure the engine and replace the impeller.
NOTE <i>☞</i>	If one engine has overheated due to a clogged sea strainer, the other engine may be close to overheating for the same reason.

J.4. Jacket Water System Checks

Take the following actions to check the function of the jacket water system:

Step	Action
1	Check the jacket water level. Check the engine and bilge for leakage. Correct casualty, then replace fluid if necessary.
NOTE <i>☞</i>	Anti-freeze is poisonous. Do not inhale the fumes.
2	Inspect the jacket water pump for normal function.
3	Check lube oil for proper quantity and quality.
4	If jacket water leaks are found, the pump is inoperative, or temperatures continue to climb, secure the engine.



NOTE 

Oil alarms and sensors are directly related to engine temperature. An overheating engine will often set off lube oil alarms.

CAUTION!

If after all efforts have been made at casualty control, including reducing the engine load, the engine temperatures do not decrease, secure the engine. The manufacturer recommends shutdown of the engine if the temperature exceeds 212°F.



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Section K. Low Voltage Alarm/Loss of Electrical Charging System

K.1. Symptoms Low voltage alarm sounds.

A low voltage alarm (Code 46, ECM Battery Low) is displayed on the electronic display module (EDM).

A significant drop in voltage is indicated by dimming lights, electronics dropping off line, and/or DDEC station control is deactivated (a low voltage alarm may/may not occur).

K.2. Actions Taking the following actions:

Step	Action
1	Reduce RPM of both engines to clutch ahead.
2	Coxswain notify crew of casualty, verify position and contact station.
3	Engineer checks position of battery isolator switches located in Survivors compartment.
4	Engineer checks engine room view port to assess situation.
NOTE  The engineer should ensure both alternator failure LED's (located on both mechanical gauge panels in the engine room) are lit.	
5	Engineer enters engine room with crew member as safety observer.
6	Check both alternator/regulator reset switches (Starboard engine room bulkhead).
7	Check condition of both engine alternator belts for slippage, damage, or missing belts. Renew belts with onboard spares as needed.
8	Check electrical connections on both alternators and lube oil pressure switches on both engines.
9	Check fuse in 24-volt start panel (Port engine room bulkhead).





Step	Action
10	Engineer checks all main battery connections in Auxiliary Machinery Compartment. Tighten and clean as necessary. The service batteries are forward and the start batteries are aft.
11	Engineer secures all non-vital equipment at the 24-VDC power supply panel.
12	Engineer secures all non-vital equipment at the 12-VDC power panel.
13	Engineer place start and service batteries in parallel.
14	Engineer determines extent of electrical power loss, probable cause, and expected service duration for platform. Crew discusses impact on mission.
15	Coxswain establishes secondary communications with station (handheld portable VHF-FM radio) in case primary power is lost.
16	Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or vessel safety will be jeopardized through continuous operation.



Section L. Flooding

L.1. Symptoms Bilge flooding alarm sounds.

L.2. Actions Maneuver the 47FT MLB into a safe area; take the following actions:

Step	Action
1	The engineer will check the control panel to identify the space where flooding is indicated. Notify the coxswain and push reset to silence alarm.
NOTE 	A sounding of the horn will indicate water in the bilge space. In underway mode, horn will sound for 8-10 seconds and silence, leaving amber indicator light lit. When in moored mode, the horn will sound continuously.
2	The engineer and a crew member will proceed to the flooded space indicated by the control panel, look through the view port in the watertight door, and report status to coxswain. If safe, enter space to investigate.
3	The engineer shall report to the coxswain the extent, cause and corrective actions necessary to control or stop the flooding.
NOTE 	The Survivors compartment bilge space is divided by the fuel tank into port and starboard gear spaces and must be checked separately for flooding.
4	The crew will prepare to apply basic casualty control procedures, making ready the damage control kit and CG-P6 pump as required.
5	The crew shall check the material condition of each compartment. Report results to the coxswain.
6	After damage has been assessed, determine whether it is safe to proceed with the mission or return to the unit.
CAUTION!	The bilge flooding alarm system is designed to notify the crew of an onboard EMERGENCY underway as well as dockside. This system should be confirmed operational prior to and upon return from any missions or sorties.





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Section M. Hard Grounding

M.1. Symptoms The 47FT MLB hits bottom and becomes hard aground (unable to initially float free).

M.2. Actions Assess the resulting damages; take the following actions:

Step	Action
1	Reduce RPM to both engines to neutral.
NOTE 	In the event of flooding, the bilge flooding alarm system will sound the horn for approximately 8-10 seconds, then secure when in the “underway” mode. When set to the “moored” mode, the horn will sound continuously. The amber bilge alarm light located on the Open Bridge will remain energized regardless of which mode the selector switch is in.
2	Notify crew of casualty and assess condition of crew.
3	Evaluate the situation. Verify current position and depth of water, and notify the station.
4	Engineer check gear space and shaft seals for obvious flooding or damage.
NOTE 	The Survivors compartment bilge space is divided by the fuel tank into port and starboard gear spaces and must be checked separately for flooding.
5	Engineer checks engine room through view port to assess obvious flooding or damage.
6	Engineer enter the engine room with a crewman as safety observer. Check bilges for flooding or obvious damage, particularly around the strut mounting points.
7	Check lazarette for any signs of flooding, rudder or steering system damage.



Step	Action
8	Engineer check for proper cooling water circulation or debris in strainers. Secure engine if cooling is inadequate or excessive debris (especially sand) is observed.
9	Crew member check Auxiliary Machinery Compartment bilges for flooding or obvious damage. Assess situation by observing through view port before entering compartments.
10	Crewman checks forepeak void for flooding by removing 2” drain plug at Bulkhead 15.
11	Crew member to rig anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the coxswain.
12	Crew member takes depth soundings all around the vessel. Coxswain determines deepest water, extent of grounding, and potential for underwater damage.
13	Consider present and future state of tide, current or other weather conditions with regard to re-floating or salvage operations.
14	Deploy anchor if situation involves potential for being set further aground due to conditions.
15	Coxswain determines safest direction to deep water and method for extracting vessel safely with least damage.
16	Conduct checks of propulsion system integrity prior to attempting re-floating or salvage. Take caution to reduce further damage.
17	Conduct check of steering system integrity. Check rudder travel for limitations utilizing hydraulic helm (not jog levers). Take caution to reduce further damage.
18	Coxswain maneuver into safe water (deep enough and out of the surf zone). Use only the engines if damage to the steering system occurred.
19	Coxswain conducts steering check, including helm and jog lever control, to identify limitation or isolate areas of damage.



Step	Action
20	Coxswain will check engine RPM in both neutral and engaged individually, at various speeds, while the engineer checks for vibration and damage in the engine room and Marine Gear spaces.
21	Return to station or appropriate haul-out facility at reduced speed/one engine to prevent additional damage, if necessary.
22	Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or vessel safety will be jeopardized through continuous operation.



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Appendix A. Outfit List and Stowage Plan

Introduction

This appendix contains the standard stowage plan for the 47FT MLB outfitting. No deviation from this list is authorized, except in the event that the addition of portable equipment, not part of the standard boat outfit, is necessary to meet mission needs; units are authorized to temporarily carry this extra equipment.

This authorization is on case by case basis only, and care must be taken to properly secure any extra gear and to ensure it does not interfere with safe egress or the boat's standard outfit/systems. Under no circumstances shall permanent alterations be made to power, stow or in any way accommodate extra equipment.

In this Appendix

This appendix contains the outfit list and stowage plan for the following areas of the 47FT MLB:

Topic	See Page
Forward Compartment	A-3
Survivors Compartment	A-5
Enclosed Bridge	A-7
Open Bridge	A-9
Main Deck	A-11
Engine Room	A-13



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Forward Compartment		
Item	Quantity	Location
Lube Oil (2104) 40 Weight	5.5 gallons	Port stowage bin, secured IAW belt (See Appendix B: EC-005)
Tellus T-15 Hydraulic Fluid	1 gallon	Port stowage bin, secured IAW belt (See Appendix B: EC-005)
Damage Control Kit	1 each	Port stowage bin
Hearing Protection	3 each	Port stowage bin
Portable Marine Toilet	1 each	Port side on deck, secured
Toilet Paper Dispenser	1 each	Bulkhead 10, mounted
Boat Crew Safety Belt	4 each	Bulkhead 15, secured (may be kept ready) accessible in Survivors compartment
PFD'S (adult) Type III, IAW COMDTINST M10470.10 (series)	4 each	Port handrail, secured
PFD'S (adult) Type I, IAW COMDTINST M10470.10 (series)	5 each	Bracket starboard side Bulkhead 10, secured
PFD'S (child) Type I, IAW COMDTINST M10470.10 (series)	5 each	Bracket starboard side Bulkhead 10, secured
Blankets	4 each	Starboard stowage bin
Pillows (covered)	2 each	Starboard stowage bin
Bell w/Clapper (when not mounted)	1 each	Starboard stowage bin
Hand Held Spot Light	1 each	Starboard stowage bin
Boat Pyrotechnics, IAW COMDTINST M8000.2 (series) and ALCOAST 535-02	1 kit	Starboard stowage bin



Forward Compartment (continued)		
Item	Quantity	Location
Mouth Horn, Reed, Fog	1 each	Starboard stowage bin
Boat Crew Survival Vest, IAW COMDTINST M10470.10 (series)	4 each	Hung with Type III PFD's Port handrail, secured or readily available folded behind handrails
Bloodborne Pathogen Kit (3XXL, 3XL, 2L, 2M)	10 each	Starboard stowage box
Stowage Boxes	2 each	Port/ Starboard sides secured in brackets



Survivors Compartment		
Item	Quantity	Location
Battle Lantern	1 each	Starboard bulkhead
Flashlight	1 each	Mounted on sink
Start and Stop Procedures	1 each	Mounted to sink
Hearing Protection	2 each	Bulkhead 5, secured
Stokes Litter, IAW COMDINST M10470.10 (series)	1 each	Port bulkhead, secured
Rescue Swimmers Pack, IAW COMDTINST M10470.10 (series) (Harness, min 70' Line, Mask, Fins, Snorkel)	1 each	On stokes litter
Fire Extinguisher, 5 lb CO ₂	1 each	Bulkhead 5, secured in bracket
Fire Extinguisher, 10 lb PKP	1 each	Starboard bulkhead, secured in bracket
FAT Kit	1 each	Bulkhead 5, secured
Water Jug	5 gallons	Port side above sink, secured
Hot Cups	2 each	Bulkhead 5
Grounding Wand	1 each	Starboard bulkhead, secured
Chow Box w/Emergency Rations (optional)	1 each	Center gear space, secured IAW belt (See Appendix B: EC-005)



Survivors Compartment (continued)		
Item	Quantity	Location
Spare Parts Box (*)	1 each	Center gear space, secured IAW belt (See Appendix B: EC-005)
* Required Contents:		
(1) Primary Fuel Filters 3201 PUL with bowls attached (2)		
(2) R/W Pump Impellers (12 blade) (2)		
(3) R/W Pump Cover Gaskets (2)		
(4) Generator Belt (set) EC-037		
(5) Alternator Belt (set)		
(6) Duct Tape (roll)		
(7) Electrical Tape (roll)		
(8) Air Pump		
(9) Misc. Fuses and Bulbs		



Enclosed Bridge		
Item	Quantity	Location
Chart Table Light (red lens)	1 each	Above chart box
Chart Bag with CG logo (*)	1 each	Bulkhead by port chair
Battle Lantern	1 each	Aft bulkhead
Binoculars (7X50)	1 each	Starboard bulkhead, secured in bracket
Fire Extinguisher 10 lb PKP	1 each	Starboard bulkhead
Fire Extinguisher 5 lb CO2	1 each	Port side deck
* Required Contents:		
(1) Charts (as required)		(11) Tide Book(**)
(2) Pencils (as required)		(12) Coast Pilot(**)
(3) China Markers (as required)		(13) NAVRULS
(4) Stop Watch		(14) Light List(**)
(5) Search Pattern Slide Rule		(15) Nautical Slide Rule
(6) Parallel Rule		(16) Chart One
(7) Weems Plotter		(17) Note Pad
(8) Anemometer		(18) Compass Deviation Table (or posted on chart table)
(9) Gum Eraser		(19) Flashlight with Red Lens
(10) Pencil Lead Sharpening Pad		(20) Compass and dividers
<i>(**) Appropriate pages as required</i>		



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Open Bridge		
Item	Quantity	Location
Ring Buoy, 30" Diameter	2 each	Port/starboard side
Float Light w/Attachment Line	2 each	Port/starboard side, (See Appendix B: EC-019)
Throw Bags	2 each	On handrails
Bell w/Clapper (when mounted)	1 each	Aft port handrail
Diver's Knife	1 each	Port stanchion, behind ladder



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Main Deck		
Item	Quantity	Location
Anchor Line 2¼" DBN on Reel	300'	Port forward deck locker
³ / ₈ " S/S Chain	9'	Attached to anchor line
³ / ₈ " S/S Shackles	2 each	Attached to anchor line
³ / ₈ " S/S Swivel	1 each	Attached to anchor line
T-Handle	1 each	Port forward deck locker
Fenders	4 each	Port and starboard forward deck lockers
Alongside Lines (sizes as required)	8 minimum	Starboard forward deck locker
Boat Hooks with hull numbers, 8' Expandable with skiff hook attachment and holders	2 each	Port/Starboard superstructure
Towline 3¼" DBN	900'	Lower tow reel
Towline 2" DBN	300'	Upper tow reel
Tow Reel Hand Crank	1 each	On tow reel frame, secured
CG-P6 Dewatering Pump, IAW COMDTINST M10470.10 (series)	1 each	Starboard aft deck
Drogue/Grapple Line 2¼" DBN with 2" S/S Thimble, ³ / ₈ " S/S Swivel, ³ / ₈ " S/S Shackle	200'	Port aft deck box
Drogue, small and large	1 each	Port aft deck box
Marlin	1 roll	Port aft deck box
Heaving Lines	2 each	Port aft deck box
Chafing Gear	as required	Port aft deck box
Assorted S/S Shackles	as required	Port aft deck box
Wire/Kevlar Bridle (optional)	as required	Center aft deck box
DBN Bridle	as required	Center aft deck box



Main Deck (continued)		
Item	Quantity	Location
Block and Tackle Assembly for Mast	1 each	Center aft deck box
Skiff Hook (w/Pendant)	1 each	Center aft deck box
Grapnel Hook 4#	1 each	Center aft deck box
Stand Pipe Pick Up Hose w/camlock fitting	1 each	Starboard aft deck box
Fire Fighting Hose 50' w/Nozzle	1 each	Starboard aft deck box



Engine Room		
Item	Quantity	Location
Tool Box	1 each	Secured in bracket on deck



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Appendix B. Engineering Changes

Introduction This appendix contains a list of authorized Engineering Changes (ECs) for the 47FT MLB, and can be accessed via ELC Baltimore's website.

NOTE 

For a complete breakdown of the Engineering Change Number, see the Naval Engineering Manual, Chapter 041, COMDTINST M9000.6 (series).

In this Appendix

This appendix contains the engineering changes:

Topic	See Page
Engineering Changes (ECs)	B-3



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Engineering Changes (ECs)

Engineering Change Number	Subject	Date
47MLB-C-001	47FT MLB DGPS Upgrade	15 JUN 99
47MLB-C-002	47FT MLB Hull markings Change	18 JUN 99
47MLB-A-003	47FT MLB Emergency Fuel System Modification	03 MAR 00
47MLB-C-004	47FT MLB Welding Modification	28 APR 00
47MLB-C-004 Amendment 1	47FT MLB Welding Modification Amendment 1	18 JUN 01
47MLB-C-005	47FT MLB Seatbelt Replacement	28 APR 00
47MLB-A-006	47FT MLB Remote Air Box DEMP Fitting	17 JUN 00
47MLB-B-007	47FT MLB Shaft Isolator	12 DEC 00
47MLB-B-008	47FT MLB Fuel System Modification	18 JUN 01
47MLB-B-009	47FT MLB Enclosed Bridge Coxswain Chair Footrest Removal	29 MAY 01
47MLB-B-010	47FT MLB Heat Exchanger Cap and Filler Neck Conversion	29 MAY 01
47MLB-B-011	47FT MLB Engine Fuel Line Conversion	18 JUN 01
47MLB-C-012	47FT MLB Alternator Replacement	01 AUG 01
47MLB-A-013	47FT MLB STIDD Chair Modification	02 AUG 01
47MLB-A-014	47FT MLB Open Bridge Protective Start-Stop Pushbutton Covers	05 NOV 01
47MLB-A-014 Amendment 1	Open Bridge Protective Start-Stop Pushbutton Covers Amendment 1	14 APR 03



Engineering Change Number	Subject	Date
47MLB-A-015	47FT MLB Bilge Alarm Modification	28 DEC 01
47MLB-B-016	VHF Upgrade	04 APR 02
47MLB-B-016 Amendment 1	VHF Upgrade Amendment 1	06 DEC 02
47MLB-B-016 Amendment 2	VHF Upgrade Amendment 2	11 MAY 06
47MLB-B-016 Amendment 3	VHF Upgrade Amendment 3	21 JUN 06
47MLB-B-017	Propulsion shaft seal replacement	31 JUL 02
47MLB-B-018	Engine Room Ventilation Piping Modification	06 AUG 02
47MLB-A-019	Strobe Light Bracket and Recovery Recess Platform Drains	17 SEP 02
47MLB-B-020	Reduction Gear Modification	09 OCT 02
47MLB-B-021	47FT MLB Line Cutter Installation	31 OCT 02
47MLB-A-022	47FT HVAC Upgrade	21 JAN 03
47MLB-A-023	47FT MLB Throttle Interrupt	02 MAY 03
47MLB-A-024	Sea-Valve and Piping Replacement	03 SEP 03
47MLB-B-025	Balmar Alternator Load Sharing System (Centerfielder)	16 JAN 04
47MLB-A-026	Open Bridge CO2 Actuator Removal	06 JAN 04
47MLB-A-026 Amendment 1	Open Bridge CO2 Actuator Removal Amendment 1	10 JUN 04
47MLB-B-027	Exhaust Muffler Isolation Valve Installation	06 FEB 04
47MLB-B-028	Chart Table replacement	02 MAR 04
47MLB-B-029	Fore Peak Hatch Installation	30 APR 04



Engineering Change Number	Subject	Date
47MLB-A-030	STIDD Chair Deck Track Slides	17 AUG 04
47MLB-B-031	1SG38-SINS(V) 2 Installation	27 AUG 04
47MLB-C-032	Tripod Gun Mount	12 JAN 05
47MLB-A-033	Open Bridge Shock Mitigating Helm Chair Installation	17 MAY 05
47MLB-B-034	Horn Replacement	17 AUG 05
47MLB-A-035	Fuel Return Line Modification	03 JAN 06
47MLB-C-036	Structural Reinforcement	08 JUN 06
47MLB-C-037	Electrical System Upgrade	17 JAN 07
47MLB-C-038	Radar Foundation Reinforcement	02 DEC 06
47MLB-B-039	Installation of the AIS [1SG38-AIS-AFLOAT(V)3]	04 DEC 06



Appendix C. Materiel Inspection Checklist

Introduction

This appendix is meant to be a systematic means to inspect any 47FT MLB and ensure the entire boat is prepared to meet mission demands. Also, this appendix should be used in conjunction with Appendix A and B.

This checklist may be locally reproduced.

In this Appendix

This appendix contains the Materiel Inspection Checklist for the 47FT MLB. This inspection list covers the following areas of the boat:

No.	Topic	See Page
I.	Forepeak	C-5
II.	Forward Compartment	C-7
III.	Auxiliary Machinery Compartment	C-9
IV.	Survivors Compartment	C-11
V.	Gear Space	C-13
VI.	Engine Room	C-15
VII.	Lazarette	C-21
VIII.	Enclosed Bridge	C-23
IX.	Open Bridge	C-29
X.	Mast Platform	C-33
XI.	Main Deck	C-35
XII.	Superstructure	C-39
XIII.	Hull	C-41
XIV.	Dockside Trials Port Engine	C-43
XV.	Dockside Trials Starboard Engine	C-45
XVI.	Under Way Trials Port Engine	C-47
XVII.	Under Way Trials Starboard Engine	C-49



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Materiel Inspection Checklist

Boat Number: _____

Station: _____

Date: _____

- References:**
- 47FT MLB Operators Handbook, COMDTINST M16114.25 (series)
 - Naval Engineering Manual, COMDTINST M9000.6 (series)
 - Coatings and Color Manual, COMDTINST M10360.3 (series)
 - Rescue and Survival Systems Manual, COMDTINST M10470.10 (series)
 - Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series)
 - PMS Manual, TP 3343

Inspection Standards: The following inspection standards apply to the 47FT MLB’s hull, superstructure, machinery, equipment, outfit, and installed systems and accessories:

- Operates smoothly and correctly.
- Free of grease, oil, rust, and corrosion.
- All fluid levels and pressure readings are within parameters.
- Protective coatings applied correctly and neatly.
- Free of rips, tears, abrasions, and cracks.
- Labels/test dates/placards properly indicated.
- Outfit and equipment correctly installed/adjusted.
- Outfit and equipment stowed according to specifications and stowage plan.
- Free of non-standard/unapproved installations or equipment.
- Maintained according to current manufacturer’s guidelines and Commandant Directives.

Inspection Guidelines: Inspection requires a minimum of two personnel, preferably one Boatswains Mate and one Machinery Technician, both of who possess extensive 47FT MLB experience and a strong working knowledge of the references listed above. This materiel inspection checklist is only applicable to boats in a “Bravo” or “Ready for Sea” condition. Each item on the checklist should be judged against the applicable standard(s) and reference(s). Additional discrepancies such as uninstalled Engineering Changes, etc. should be listed.

Inspected By: _____



Appendix C – Materiel Inspection Checklist



I. Forepeak

Item	SAT	UNSAT	Remarks
QAWTH (See Appendix B: EC-029)			
Vent			
Bilge			
Bulkhead			
Overhead			
Drain Plug			
Hand Hold			
Step Bar			

REMARKS: _____



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II. Forward Compartment

Item	SAT	UNSAT	Remarks
Escape Hatch			
Escape Ladder			
Dorade Vent Pipe with Securing Device			
Bulkheads			
Frames/Longitudinals			
Bulkhead 10 Vent Hole			
Stanchion			
Bilges			
Overhead			
Insulation			
Wiring/Wire Clamps			
Lighting /Switch			
Multi-Cable Transit Run			
Deck Grating/Latches			
PFD Adult Type III (4 each) Port Handrail Secured on Hangers			
Boat Crew Survival Vest (4 each) IAW Rescue and Survival Systems Manual COMDTINST M10470.10 (series), Secured. (May also be stowed for ready access in Survivors compartment.)			
Boat Crew Safety Belt (4 each), Secured. (May also be stowed for ready access in Survivors compartment.)			
Porta-Potti, Secured.			
Toilet Paper/Dispenser			
Life Jackets Type I, 5 Adult/ 5 Child on Bulkhead 10 Brackets, Secured			
Bilge Pump/Piping			
Bilge Pump Sensors			
Fire Alarm			
Intercom			



II. Forward Compartment (continued)

Item	SAT	UNSAT	Remarks
Stowage Bin (Port) w/Latch Closure			
Lube Oil 2104 (5 gallon) Secured (See Appendix B: EC-005)			
Tellus T-15 (1 gallon) Secured (See Appendix B: EC-005)			
DC Kit			
Hearing Protection (3 each)			
Stowage Bin (Starboard) w/Latch Closure			
Blankets (4 each)			
Pillow (2 each)			
Bell with Clapper (when not mounted)			
Handheld Spotlight			
Boat Pyrotechnics Boxed IAW Ordnance Manual COMDTINST M8000.2 (series)			
Mouth Fog Horn			
Blood Borne Pathogen Kits 3XXL, 3XL, 2L, 2M (10 each)			

REMARKS: _____



III. Auxiliary Machinery Compartment

Item	SAT	UNSAT	Remarks
WTD to Forward Compartment			
Insulation			
Bilge			
Bulkheads			
Frames/Longitudinals			
Overhead			
Stanchions			
Handholds			
Step			
Deck Grating/Latches			
Batteries/Box			
Bilge Pump/Piping			
Bilge Pump Sensors			
Isolation Transformer			
Shore Power Circuit Breaker Panel			
All Junction Boxes			
24-Volt Power Panel			
Amp. Meter			
Volt Meter			
120-Volt Power Panel			
Amp Meter			
Volt Meter			
12-Volt Power Panel			
Amp Meter			
Volt Meter			
12-Volt Power Converter			
Wiring/Wire Clamps			
Grounding Plate			
ERIM			
EGIM			
Sea Power User Panels EC-037			
Sea Power Conversion Units EC-037			
Battery Charger EC-037			



III. Auxiliary Machinery Compartment (continued)

Item	SAT	UNSAT	Remarks
CO ₂ Bottles/Piping			
HVAC R/W Supply Valve			
HVAC R/W Strainer			
HVAC R/W Pumps/Hoses			
Multi-Cable Transit Runs			
Lighting/Switch			
Cables/Cable Penetrations			
Vents/Vent Motor			
Vent Cleanout			
Auxiliary Space Vent Fan Switch			
Bulkhead Piping Penetrations			
EWRS Compressor Assembly/Piping EC-034			
Placards			

REMARKS: _____



IV. Survivors Compartment

Item	SAT	UNSAT	Remarks
WTD to Auxiliary Machinery Compartment			
WTD to Engine Room			
WTD to Aft Deck			
WTD to Enclosed Bridge			
Insulation			
Bulkheads			
Overhead			
Reduction Gear Lifting Eyes			
Wiring/Wire Clamps			
Handholds			
Ladder			
Step			
Windows			
Lighting/Light Switches			
Decking/Latches			
Battery Cutout Switches			
Emergency Fuel Cut Out Pull Handles			
CO₂ System			
Activation Bottle			
Delay Bottle			
Pressure Switches			
Placards			
CO ₂ Piping (See Appendix B: EC-026)			
CO ₂ Alarm Panel			
Survivors Seating			
Seat Belts (See Appendix B: EC-005)			
HVAC Unit (See Appendix B: EC-022)			
HVAC Control Panel			
HVAC R/W Hoses			
Vent Ducting			



IV. Survivors Compartment (continued)

Item	SAT	UNSAT	Remarks
Vent Cleanout (2 each)			
Hydraulic Tubing			
Console Vent Fan/Ducting			
All Junction Boxes			
Tow Reel Disconnect Switch			
Battle Lantern			
Sink			
Sink Drain Valve/Piping			
Flashlight (mounted on sink) (1 each)			
Engine Light Off/Securing Procedures (mounted on sink)			
Hearing Protection (2 each)			
Placards			
Multi-Cable Transit Runs			
Wiring			
Stokes Litter Secured			
Rescue Swimmers Pack (on stokes) with Minimum 70' Line, Harness, Mask, Fins, Snorkel			
CO ₂ Fire Extinguisher (5 lb)			
PKP Fire Extinguisher (10 lb)			
EMT Kit Secured			
Water Jug Secured			
Hot Cups			
Grounding Stick			
Intercom			
Lighting/Switch			

REMARKS: _____



V. Gear Space

Item	SAT	UNSAT	Remarks
Starboard Side			
Starboard Reduction Gear			
Reduction Gear Mount Bolts			
Control Valve			
Pressure Build Up Valve			
Reduction Gear Cooler			
Duplex Filter			
Floc Fitting/Hose			
Propeller Shaft/Seal			
Cardan Shaft/Seal			
Cardan Shaft Guard			
Wire/Cable/Wire Clamps			
Insulation			
Pull Cable Connection Box			
Center Dividing Screen			
HVAC R/W Piping			
Bilge Pump/Piping			
Bilge Pump Sensors			
Bilge Pump Junction Boxes			
Fuel Tank Level Sensor			
Speed Log			
Speed Log and Depth Sounding Emergency Blanking Plug (secured to inboard mesh screen)			
Bilge			
Frames/Longitudinals			
Port Side			
Port Reduction Gear			
Reduction Gear Mount Bolts			
Control Valve			
Pressure Build Up Valve			
Reduction Gear Cooler			
Duplex Filter			
Floc Fitting/Hose			



V. Gear Space (continued)

Item	SAT	UNSAT	Remarks
Cardan Shaft/Seal			
Cardan Shaft Guard			
Wire/Cable/Wire Clamps			
HVAC R/W Piping			
Insulation			
Pull Cable Connection Box			
Center Dividing Screen			
Vent Drain Piping			
Bilge Pump/Piping			
Bilge Pump Sensors			
Bilge Pump Junction Boxes			
Transducer			
Bilge			
Frames/Longitudinals			
Center			
Fuel Tank Access Cover (3 each)			
Fuel Tank Stripping Port			
Insulation			
Chow Box (optional) Secured			
Spare Parts Box Secured			
2 Primary Fuel Filters w/bowls attached			
2 Raw Water Pump Impellers (12 blade)			
2 Raw Water Pump Cover Gaskets			
Generator Belt Set (EC-037)			
Alternator Belt Set			
Roll Duct Tape			
Roll Electrical Tape			
Air Pump			
Miscellaneous Fuses and Bulbs			

REMARKS: _____



VI. Engine Room

Item	SAT	UNSAT	Remarks
Port Engine			
Block			
Heads			
Oil Pan			
Gear Train Housing			
Exhaust Piping			
Turbocharger			
Blower			
Airsep System			
Fuel System			
Fuel Filters			
Lube Oil System			
L/O Filter with Sampling Valve			
Jacket Water System			
Raw Water System			
Air Shutdown Solenoid			
ECM			
MIM			
DDEC Sensors			
Wiring/Wire Clamps			
Hot Start			
Generator/Belts EC-037			
Alternator/Belts			
Cardan Shaft Guard			
Cardan Shaft/Coupling			
Steering Pump/Hoses			
Engine Mounts			
Starter			
FLOC System			
Starboard Engine			
Block			
Heads			
Oil Pan			



VI. Engine Room (continued)

Item	SAT	UNSAT	Remarks
Gear Train Housing			
Exhaust Piping			
Turbocharger			
Blower			
Airsep System			
Fuel System			
Fuel Filters			
Lube Oil System			
Lube Oil Filter with Sample Valve			
Jacket Water System			
Raw Water System			
Air Shutdown Solenoid			
ECM			
MIM			
DDEC Sensors			
Wiring/Wire Clamps			
Hot Start			
Generator/Belts EC-037			
Alternator/Belts			
Cardan Shaft/Coupling			
Cardan Shaft Guard			
Steering Pump/Hoses			
Engine Mounts			
Starter			
FLOC System			
Overhead			
Insulation			
Wiring/Hoses/Tubing			
Clamps			
24-Volt DC Lighting/Switch			
Lighting Junction Box			
Exhaust Piping/Hangers			
Engine Room Vent			



VI. Engine Room (continued)

Item	SAT	UNSAT	Remarks
Soft Patches			
CO ₂ Strobe Light			
Smoke/Heat Detector			
Hand Holds			
Gauge Panels			
Aft Bulkhead			
Insulation			
Wiring/Hoses			
Clamps			
Multi-Cable Transit Run			
Mufflers/Piping/Crossover Isolation Valve (See Appendix B: EC-027)			
Dewatering Standpipe/Strainer			
Tow Bit Stanchion			
Placards			
Port Side			
Insulation			
Wiring/Clamps			
Engine Start Interface Panels			
Voltage Regulator			
Bilge Pump Piping			
Fwd Bulkhead			
Insulation			
Wiring/Hoses/Tubing/Cables			
Clamps			
All Junction Boxes			
Placards			
24-Volt DC Lighting			
Cardan Shaft Seals			
Handholds			
Intercom			



VI. Engine Room (continued)

Item	SAT	UNSAT	Remarks
Fuel Tank Sounding Tube			
Multi-Cable Transit Runs			
Bulkhead Penetrations			
110-Volt Receptacles			
Engine Safety Cutout Switches			
CO ₂ Siren			
CO ₂ Discharge Nozzle			
Ladder with Locking Pins			
Starboard Side			
Insulation			
Wiring/Hosing/Tubing			
Clamps			
Bilge Pump Piping			
Isolator Junction Box			
Alternator Circuit Breakers			
Alternator Voltage Regulator			
Steering System Pressure Gauge			
Steering Reservoir			
Filter/Cooler/Control Valve Assembly			
Steering Pressure Switch			
Steering Cooler Raw Water Valve			
Auto Pilot Pump			
Bilge			
Grating/Latches			
Wiring/Clamps			
Fuel System Piping			
Fuel Emergency Cutout Valves			
Bilge Pump/Hoses			
Bilge Pump Sensors			
Tool Box			
Strut Mount Bolts			



VI. Engine Room (continued)

Item	SAT	UNSAT	Remarks
Raw Water Ball Valves (See Appendix B: EC-024)			
Raw Water Strainers/Piping/Hoses			
De-Icing Valves			

REMARKS: _____



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VII. Lazarette

Item	SAT	UNSAT	Remarks
WTD			
Overhead			
Bulkheads			
Bilge			
Wiring/Wire Clamps			
Multi-Cable Transit Run			
Lighting			
All Junction Boxes			
Bulkhead Penetrations			
Bilge Pump/Piping			
Bilge Pump Sensors			
Standpipe			
Vent Piping (See Appendix B: EC-018)			
Servo Power Cylinder			
Hydraulic Hoses/Tags			
Tie Rod			
Rudder Posts			
Rudder Angle Indicator			
Auto Pilot Indicator			

REMARKS: _____



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VIII. Enclosed Bridge

Item	SAT	UNSAT	Remarks
WTD to Open Bridge			
Overhead			
Bulkhead			
Deck			
Wiring/Cables/Wire Clamps			
Insulation			
Opening Windows			
Heated Windows			
Side Windows			
Window Blowers			
Helmsman Chair Port w/Seatbelt (See Appendix B: EC-005 and EC-009)			
Port Chair Jog Lever			
Helmsman Chair Starboard w/Seatbelt (See Appendix B: EC-005 and EC-009)			
Starboard Chair Jog Lever			
Bolster Seat Port w/Seatbelt (See Appendix B: EC-005)			
Bolster Seat Starboard w/Seatbelt (See Appendix B: EC-005)			
CO ₂ Fire Extinguisher (5 lb)			
PKP Fire Extinguisher (10 lb)			
Battle Lantern			
Binoculars			
Navigation Light Control Panel			
Ladder			
Handholds			
HF Radio			
HVAC Unit (See Appendix B: EC-022)			
HVAC Hoses			
HVAC Unit Control Panel			
Deck Drains			
Multi-Cable Transit Runs			
Lighting/Switch			



VIII. Enclosed Bridge (continued)

Item	SAT	UNSAT	Remarks
Red Light Glare Protectors			
Windshield Wiper Motors			
Bilge Alarm Panel (See Appendix B: EC-015)			
Bilge Pump Control Panel			
Hydraulic Steering Valves/Piping			
Ventilation Ducting			
All Junction Boxes			
CSIM (3 each)			
Placards			
Open Bridge Console Access Covers			
Wiring Inside Open Bridge Consoles			
Open Bridge Console Vent Ducting			
EWRS			
CO ₂ Back Up Actuator/Pull String/Seal			
Port Water Sensor			
Starboard Water Sensor			
EWRS Tubing			
Port EWRS Actuator			
Starboard EWRS Actuator			
EWRS Test Switch			
Port EWRS Reset Switch			
Starboard EWRS Reset Switch			
Overhead Console			
Steering Gear Low PSI Warning Light/Alarm			
Fuel Gauge			
Dimmer Switch			
Open Bridge Console Vent Switch			
Engine Start Control Switches			
Electronic Display Modules			



VIII. Enclosed Bridge (continued)

Item	SAT	UNSAT	Remarks
Fire Alarm Test Switch			
Dimmer Fuse			
Fire Alarm/Warning Light			
Blue Light Switch			
Weather Deck Lighting Switch			
Port Console			
Console Access Hatch/Wiring Inside			
Removable Footplate			
GPS			
Auto Pilot			
Auto Pilot Select Button			
Radar Select Switch			
Horn			
Center Console			
Digital Compass			
Window Washer Switch			
Window Wiper Switches			
Window Heater Switches			
Wiper Speed Controls			
Window Blower Switches			
CO ₂ Activation Bottle/Tubing			
Radar/Chart Plotter (See Appendix B: EC-031)			
Depth Finder			
Rudder Angle Indicator			
Throttle Controls			
Throttle Control Panel			
Emergency Back-Up Panel			
Engine Start/Stop Push Buttons (See Appendix B: EC-014-A)			
Searchlight Control			
DDEC Ignition Switch			
Engine Air Shutdown Pulls			
Access Cover			



VIII. Enclosed Bridge (continued)

Item	SAT	UNSAT	Remarks
Starboard Console			
Console Access Hatch/Wiring Inside			
Removable Footplate			
VHF-FM Radio/Speaker/Microphone (Motorola) (See Appendix B: EC-001)			
VHF-FM Radio/Speaker/Microphone (Standard Horizon) (See Appendix B: EC-016)			
VHF-FM Direction Finder/Speaker			
Loudhailer/Intercom/Microphone			
VHF-FM Fuses			
Window Heater Fuses			
Chart Table (See Appendix B EC-028)			
Navigation Kit			
Briefcase with CG Logo			
Pencils			
China Markers			
Compass and Dividers			
Stop Watch			
Search Pattern Slide Rule			
Compass Deviation Table			
Parallel Rule			
Weems Plotter			
Anemometer			
Gum Eraser			
Pencil Lead Sharpening Pad			
Tide Book (appropriate pages as required)			
Coast Pilot (appropriate pages as required)			



VIII. Enclosed Bridge (continued)

Item	SAT	UNSAT	Remarks
Navigation Rules, International-Inland COMDTINST 16672.2 (series)			
Light List (appropriate pages as required)			
Chart One			
Note Pad			
Nautical Slide Rule			
Flashlight with Red Lens			
Charts for Area			
Chart Table Light (red lens)			

REMARKS: _____



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IX. Open Bridge

Item	SAT	UNSAT	Remarks
Windscreen			
Handholds (See Appendix B: EC-004)			
Port Helmsman Chair w/Seatbelt (See Appendix B: EC-005 and EC-030)			
Starboard Helmsman Chair w/Seatbelt (See Appendix B EC-005 and EC-030)			
Jump Seats w/Seatbelts (2 each) (See Appendix B: EC-005)			
Handrails			
D-rings			
Vent Pipe			
Port Ring Buoy 30" & Floating Electric Marker Lights (See Appendix B: EC-019)			
Starboard Ring Buoy 30" & Floating Electric Marker Lights (See Appendix B: EC-019)			
Rescue Line Throw Bags (2 each)			
Bell with Clapper (when mounted)			
Bell Mount			
Docking Lights			
Multi-Cable Transit Run			
HF Antenna Coupler			
HF Antenna			
Halyard Cleat			
Safety Line			
Placards			
Deck/Non-Skid			
Port Console			
Rudder Angle Indicator			
Engine Tachometers			



IX. Open Bridge (continued)

Item	SAT	UNSAT	Remarks
Throttle Controls			
Throttle Control Panel			
Engine Start/Stop Push Buttons (See Appendix B: EC-014)			
Jog Lever			
Dimmer Switch			
Handheld Spotlight Connection			
Access Cover			
Vent Grating			
Console Drain Ball			
Center Console			
Depth Finder			
Digital Compass			
Fire Alarm Light (red)			
Fire Alarm Silence Switch			
Steering Gear Low Pressure Light (red)			
Bilge Alarm Light (amber)			
Engine Air Shutdown Pulls			
Electronic Display Modules			
Radar/Chart Plotter (See Appendix B:EC-031)			
Speakers (See Appendix B: EC-016)			
Starboard Console			
Searchlight Control Panel			
Electronics Enclosure			
Enclosure Door			
VHF-FM Radio (Motorola) (See Appendix B: EC-001)			
GPS			
Loudhailer Microphone			
Rudder Angle Indicator			
Gauge Light Dimmer			



IX. Open Bridge (continued)

Item	SAT	UNSAT	Remarks
Auto Pilot Select Button			
Deck/Spotlight Lighting Switches			
Throttle Controls			
Throttle Control Panel			
Horn Button			
Auto Pilot (See Appendix B: EC-014)			
Helm			
Helm Unit Pump			
Magnetic Compass			
Console Drain Ball			
Access Cover			
Vent Grating			

REMARKS: _____



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X. Mast Platform

Item	SAT	UNSAT	Remarks
Flange Mounts (4 each)			
Stanchions/Gussets (See Appendix B: EC-004-A)			
Step			
Drain Plug			
Mast Receiver Mount			
Radar Antenna			
Loudhailer Speaker			
Buoyancy Box			
Blue Light			
DGPS Antenna (See Appendix B: EC-001)			
VHF-FM Antenna (Motorola)			
Aft Deck Working Lights			
Forward/Aft Spotlight			
Horn			
Handholds			
D-Rings			
Wiring			
Wire Clamps			
Mast Junction Box			
Mast			
Wiring			
Wire Clamps			
D-Rings			
Masthead Light (2 each)			
Amber Towlight (2 each)			
Stern Light			
Searchlight			
VHF-FM Antenna (standard)			
VHF-FM DF Antenna			



X. Mast Platform (continued)

Item	SAT	UNSAT	Remarks
Anchor Light			
National Ensign/Coast Guard Ensign			
Flag Halyard			

REMARKS: _____



XI. Main Deck

Item	SAT	UNSAT	Remarks
Tow Bit			
Towline 3¼" DBN (900')			
Towline 3¼" Reel			
Towline 2" DBN (300')			
Towline 2" Reel			
Tow Reel Hand Crank Secured w/Strap			
Diver's Knife			
Taffrail			
Engine Room Soft Patches			
Safety Grab Lines			
D-Rings			
Paired Bits (8 each)			
Closed Chocks (8 each)			
Opening Bull Nose w/Locking Pin and Retaining Cable			
Forward Anchor Bit			
Forepeak Vent (See Appendix B: EC-004)			
Dorade Vent			
Escape Hatch			
Gun Mounts (See Appendix B: EC-032)			
Deck			
Deck Non-Skid			
Port Recovery Recess			
Hinged Walking Flat with Locking Pins and Retaining Cables (See Appendix B: EC-019)			
Fuel Tank Vent			
Ladder			
Steps			
Handrail			
Sink Drain Piping			
Grab Lines Along Hull			



XI. Main Deck (continued)

Item	SAT	UNSAT	Remarks
D-Rings			
Drain Flap			
Starboard Recovery Recess			
Hinged Walking Flat with Locking Pins and Retaining Cables (See Appendix B: EC-019)			
Ladder			
Steps			
Handrail			
Grab Lines Along Hull			
D-Rings			
Drain Flap			
Port Fwd Deck Locker			
Anchor (19 lb.)			
Anchor Line 2¼” DBN (300’)			
Anchor Line Reel			
Anchor Chain SS (moused) (9 feet)			
3/8” SS Shackle (2 each)			
3/8” SS Swivel			
Fenders (as required)			
Watertight Hatch			
Shore Power Wiring			
T-Handle			
Starboard Fwd Deck Locker			
Alongside Lines (8 minimum)			
Fenders (as required)			
Window Washer Reservoir			
Window Washer Pump			
Window Washer Tubing			
Washer Pump Junction Box			
Deck Light Box			
Watertight Hatch			



XI. Main Deck (continued)

Item	SAT	UNSAT	Remarks
Port Aft Deck Box			
Drogue Large			
Drogue Small			
Grapnel Line 2¼" DBN (200' with 2" S/S thimble, ¾" S/S swivel, ¾" S/S shackle (moused))			
Marline (1 roll)			
Chafing Gear			
Shackles S/S (as necessary)			
Chem-Lites & Wire Ties (as necessary)			
Heaving Lines (2 each)			
Aft Engine Room Vent (See Appendix B: EC-018)			
Watertight Hatch			
Center Aft Deck Box			
Wire/Kevlar Bridle as req. (optional)			
DBN Bridle as req.			
Block and Tackle Assembly for Mast			
Skiff Hook with Pendant			
Grapnel Hook #4			
Starboard Aft Deck Box			
Engine Room Bilge Suction			
Lazarette Vent			
Aft Engine Room Vent (See Appendix B: EC-018)			
Watertight Hatch			
3" x 6' Drop Pump Pick-Up Hose			
CG-P6 Pump Sea Suction Connection			
CG-P6 Pump Fire Hose 50' w/Nozzle			
CG-P6 Pump with Can			

REMARKS: _____



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XII. Superstructure

Item	SAT	UNSAT	Remarks
Windows			
Windshield Wipers/Washers			
Enclosed Steering Overhead Exterior			
Port/Starboard Running Lights			
Shore Tie Receptacle/Box			
Hand Rails			
Auxiliary Space Vents			
Forward Compartment Vent			
Boat Hooks 8' and Holders w/hull numbers (See Appendix B: EC-004)			
Exterior Bulkheads			
Engine Room Vent			
Engine Room Vent Damper			
Fuel Fill/Sounding Rod			
Ladder to Open Steering			
Tow Reel Switch			
D-Rings			
Step Light (8 each)			

REMARKS: _____



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XIII. Hull

Item	SAT	UNSAT	Remarks
Port Hull Plating			
Starboard Hull Plating			
Transom			
Underwater Body Paint			
Above Water Paint			
Exhaust Ports			
Bilge Pump Discharge Ports (5 each)			
Sink/HVAC Drain Port (1 each)			
HVAC R/W Discharge Port (1 each)			
Rubrails			
Hull Zincs			
Hull Numbers and Lettering (See Appendix B: EC-002)			

REMARKS: _____



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XIV. Dockside Trials Port Engine

Item	SAT	UNSAT	Remarks
Proper Operation of EDM			
Oil Pressure (5 PSI minimum)			
Water Temperature (minimum 140°F)			
Reduction Gear Oil Pressure disengaged (58-66)			
Reduction Gear Oil Pressure engaged (230-290)			
Hydraulic Oil Pressure (150-250)			
User Idle Speed (750 RPM)			
Low Idle Speed (600 RPM)			
Max RPM No Load (2200)			
HVAC Operation (w/sea power)			
Engine Start and Stop (3 locations)			
Steering Operation (4 locations)			

REMARKS: _____



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XV. Dockside Trials Starboard Engine

Item	SAT	UNSAT	Remarks
Proper Operation of EDM			
Oil Pressure (5 PSI minimum)			
Water Temperature (minimum 140°F)			
Reduction Gear Oil Pressure disengaged (58-66)			
Reduction Gear Oil Pressure engaged (230-290)			
Hydraulic Oil Pressure (150-250)			
Low Hyd. Pressure Warning Light			
Fire Alarm/Warning Light			
User Idle Speed (750 RPM)			
Low Idle Speed (600 RPM)			
Max RPM No Load (2200)			
Engine Start and Stop (3 locations)			
Station Control Panel Operation			

REMARKS: _____



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XVI. Under Way Trials Port Engine

Item	SAT	UNSAT	Remarks
Oil Pressure (49-70)			
Water Temperature (160-192)			
Reduction Gear Oil Pressure (230-290)			
Full Power (2100 RPM) minimum			

REMARKS: _____



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XVII. Under Way Trials Starboard Engine

Item	SAT	UNSAT	Remarks
Oil Pressure (49-70)			
Water Temperature (160-192)			
Reduction Gear Oil Pressure (230-290)			
Full Power (2100 RPM) minimum			

REMARKS: _____



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Appendix D. Disabling Casualties

Introduction

This appendix contains disabling casualties for the 47FT MLB. Refer to Chapter 5, Section A, for steps to follow if any of these casualties occur.

In this Appendix

The appendix contains the following information:

Topic	See Page
Engine Parameters	D-3
Engineering System Components	D-3
Electronic/Navigation	D-3
Safety	D-4
General Materiel	D-4



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Disabling Casualty List

Engine Parameters

- Reduction gear pressure below 230 PSI (while engaged).
 - Reduction gear pressure below 58-66 (while disengaged).
 - Engine lube oil pressure below 49 PSI at cruising speed (1850 RPM).
 - Engine fresh water temperature below 140° F or above 212° F.
-

Engineering System Components

- Engine fails to start.
 - Uncontrollable overheat.
 - Metallic/non-metallic noise: metal on metal/fuel-knock/bearing/clicking.
 - Excessive shaft or engine vibration.
 - Engine surging/over speed (over 50 RPM).
 - Loss of engine RPM control.
 - Reduction gear fails to engage (forward or reverse).
 - Fuel oil dilution 2.5% or above.
 - Water in engine lube oil (emulsified white milky oil).
 - Lube oil in engine jacket water:
 - More than a light sheen.
 - Floating unmixed lube oil separated from the water.
 - Battery(ies) will not charge or hold a charge.
 - Complete loss of charging system.
 - Continuous electrical breaker trip.
 - Complete steering system inoperative.
 - Engine motor-mount hardware loose or missing.
 - Excessive shaft seal leak:
 - While rotating, trickle or steady stream.
 - While not rotating, more then 15 drops per minute.
-

Electronic/Navigation

- No electronic means of signaling distress (i.e. no radio etc.).
 - Electronics won't energize.
-



Safety

- Any fuel oil or lube oil dripping* on a hot surface (hot surface is defined as a surface greater than 400° F, even if covered by insulation).
- Electrical arcing and sparking.
- Turbo-charger lube oil supply line leaking on to hot surface or not fire rated/fire sleeved.
- Return fuel oil line leaking in the vicinity of the turbocharger where the turbo attaches to the saddle.
- Fixed (CO₂) fire fighting system inoperative, PLUS no portable fire extinguishers (unserviceable).
- Emergency alarms and indicator lights, where applicable, inoperative (fire, bilge, hydraulic, lube oil pressure, high water temp).

* To determine if fuel oil or lube oil dripping is occurring, a clean sheet of paper may be placed under a suspected leak to collect and detect any drops that fall.

**General
Materiel**

- Hull breach below the waterline.
 - Inoperative (open/closed) sea-chest valve, fuel shut off valve, engine shut down damper, or engine room air damper.
-



Appendix E. Restrictive and Major Discrepancies

Introduction

This appendix contains restrictive and major discrepancies for the 47FT MLB. Refer to Chapter 5, Section A, for steps to follow if any of these casualties occur.

In this Appendix

This appendix contains the following information:

Title	See Page
Restrictive Discrepancies	E-3
Major Discrepancies	E-5



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Restrictive Discrepancies

Engine and Vessel Systems

- Engine performance:
 - Maximum RPM under load (norm 2100-2200) – less than 2100 RPM.
 - Engine fresh water temperature below 212° F and above 192° F.
 - Leaks more than 15 drops per minute:
 - Jacket Water
 - Raw Water
 - Lube Oil
 - Hydraulic Oil
 - Reduction Gear Oil
 - Fuel oil dripping* (falling onto a surface which is not hot). One drop within ten (10) minutes.
 - Bilge pumps and/or pump activation sensors inoperative.
 - Bilge system check valves installed improperly or unserviceable.
 - Inaccurate pressure/temperature/fire alarms.
 - Any detectable exhaust leaks.
 - Missing exhaust lagging or system blankets.
 - Failure of any emergency system:
 - Fuel shut-off valves do not fully close.
 - Engine blower shutdown is inoperative (electronic or manual).
 - Engine room air dampener shutdown system.
 - Emergency Window Release System (EWRS) shall actuate both associated windows within 5-8 seconds.
 - DDEC Emergency Back-up Panel.
 - Loose/missing fittings, nuts, bolts, brackets, etc.:
 - Missing or loose shafting bolts:
 - Torsional coupling
 - Cardan shaft
 - Gear output flange
 - Spacer
 - Propeller shaft flange/shaft isolator (See Appendix B: EC 007) and/or lock wire missing/broken
 - Steering system:
 - Rudder post nuts
 - Steering ram mounts
 - Undersized engine mounting bolts and/or constructed of inferior grade material.
 - Battery boxes missing or not secured properly.
 - Unauthorized batteries.
-



* To determine if a fuel oil dripping is occurring, a clean sheet of paper may be placed under a suspected leak to collect and detect any drops that fall.

Boat Outfit

- Fire extinguishers not secured in brackets.
 - Loose/missing fittings, nuts, bolts, brackets, etc.:
 - Missing/loose/undersized coxswain chair mounting hardware.
 - Mast support bracket loose/missing.
 - Underweight CO2 bottle.
 - CO2 system pressure switches not operating properly.
 - Missing boat crew survival vest.
 - Missing boat pyrotechnics.
 - Portable dewatering pump kit incomplete/inoperative/missing.
 - Towline less than 100' of required length.
-

**Electronics/
Navigation**

- Compass:
 - Deviation table missing.
 - Compass deviation greater than 5 degrees.
 - Electronics:
 - VHF-FM radio inoperative.
 - Depth sounder inoperative.
 - DGPS/GPS inoperative.
 - Radar inoperative.
-

**General
Materiel and
Safety**

- Water Tight Integrity:
 - Holes/cracks in a watertight structure.
 - Cracks through a watertight scuttle/hatch.
 - Failure of a watertight closure to seal, greater than 10%.
 - Any noticeable gap at gasket seams.
 - Applied non-skid on main decks ineffective/missing (any traffic/working area without non-skid for an 8.5" X 11" area).
 - Navigation light/s inoperative.
-



Major Discrepancies

Engine and Vessel Systems

- Leaks less than 15 drops per minute:
 - Jacket Water
 - Raw Water
 - Lube Oil
 - Hydraulic Oil
 - Reduction Gear Oil
 - Any fuel leak (piping/fittings/tank) that drips less than one drop within ten minutes.
 - Bilge pump hoses missing hose clamps.
 - Loose/missing fittings, nuts, bolts, brackets, etc.*
 - Hardware on the engines used for attaching equipment.
 - Battery terminals loose or corroded.
 - Autopilot pump mounting hardware.
 - DDEC cables loose or disconnected.
- * For fasteners utilizing nyloc nuts, the bolt must engage and pass through the nylon insert, but not more than five threads.
- Flexible hoses and gauge lines used for petroleum based products not either fire rated or fire sleeved (fire sleeve properly banded at both ends).
 - Fluid levels below minimum required.
 - Engine guards inadequate/missing around moving machinery.
 - Protruding exhaust lagging securing wire.
 - Any standard boat machinery, with the exception of those listed on the disabling or restrictive list, not operating properly.
-

Electronics/Navigation

- Compass light inoperative.
 - Expired deviation table.
 - Any standard boat electronics, with the exception of those listed on the restrictive list, not operating properly.
-



**General
Materiel and
Safety**

- Watertight Integrity:
 - Improperly filled holes.
 - Hardware bolted through a watertight hatch, scuttle, or bulkhead.
 - Loose dogs/dogging arms on watertight hatch, scuttle, or bulkhead.
 - Failure of a watertight closure to seal, less than 10%.
 - Scuttle not flush with the deck, causing a tripping hazard.
 - Inability to open or close doors, hatches, or scuttles.
 - Hatch and scuttle safety locks do not engage when item is in the open position.
 - Missing breaker or open hole in any power distribution panel.
 - Any standard boat machinery or system, with the exception of those listed on the disabling or restrictive lists, not operating properly.
-



Appendix F. Full Power Trial

Introduction

This appendix contains the full power trial requirements for the 47FT MLB to ensure that the boat operates to prescribed standards.

In this Appendix

This appendix contains the following information:

Topic	See Page
Conducting a Full Power Trial	F-3



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Procedures

Conducting a Full Power Trial

Follow these procedures when conducting a full power trial.

Step	Procedure
1	Get the boat underway for a ten (10) minute transit on a relatively straight course. Bring the engine up to full speed.
2	After approximately eight (8) minutes, check engine speed on the EDM. Normal engine speed range is 2100-2200 RPM.
3	<p>Check for the following abnormalities, which occasionally occur during the full power trial:</p> <ul style="list-style-type: none"> • Any fuel or lube oil dripping* on a hot surface is a disabling casualty (hot surface is defined as a surface greater than 400° F, even if covered by insulation). • The turbocharger lube oil supply hose leaking on to a hot surface or not fire rated or fire sleeved is a disabling casualty. • A leak from the shaft seal, equivalent to a trickle or steady stream, while rotating is a disabling casualty. • Any leak from the shaft seal, in excess of 15 drops per minute, while not turning is a disabling casualty. • Any fuel oil drop* falling within 10 minutes, not on a hot surface, is a restrictive discrepancy. • Any anti-freeze, raw water, lube oil, or hydraulic oil leaks greater than 15 drops per minute are a restrictive discrepancy. • Any anti-freeze, raw water, lube oil, or hydraulic oil leaks less than 15 drops per minute is a major discrepancy. • Any fuel oil leak on the fuel tank access covers greater than 1 drop in 10 minutes is a restrictive discrepancy. <p>* To determine if any drop(s) have occurred, a clean sheet of paper may be placed under a suspected leak for up to ten minutes to collect and detect any drops that fall.</p>



Step	Procedure
4	Check all gauges on the console and record the readings. Refer to Figure F-1 for allowable ranges and results:
5	Return to the mooring. Secure both engines and check all fuel fittings.

Note: The following parameters coincide with the Standardization Program

Categories	Disabling	Restrictive	Major	Normal	Major	Restrictive	Disabling
Oil Pressure	< 49			49-70			
Water Temp.	< 140			160-192	193-204	205-211	> 212
Red. Gear Pressure (engaged)	< 230			230-290			> 290
Red. Gear Pressure (disengaged)	< 58			58-66			> 66
Engine RPM		< 2100		2100-2200			

Figure F-1
Allowable Ranges and Results



Appendix G. List of Acronyms

Introduction

This appendix contains a list of acronyms used throughout the handbook.

In this Appendix

This appendix contains the following information:

Topic	See Page
List of Acronyms	G-3



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ACRONYM	DEFINITION
CASREP	Casualty Report
CO	Commanding Officer
CSIM	Control Station Interface Modules
DBN	Double Braided Nylon
DCV	Directional Control Valve
DDEC	Detroit Diesel Electronically Controlled
DGPS	Differential Global Positioning System
DIW	Dead in Water
EC	Engineering Change
ECI	Electronic Control Injectors
ECM	Electronic Control Modules
EDM	Electronic Display Modules
EGIM	Electronic Gear Interface Modules
ELC	Engineering Logistics Center
ERIM	Engine Room Interface Module
EWRS	Emergency Window Release System
EUI	Electronic Unit Injectors
GPM	Gallons Per Minute
GPS	Global Positioning System
HVAC	Heating, Ventilation, Air Conditioning System
MIM	Manufacturers Interface Modules
MLB	Motor Lifeboat
NMLBS	National Motor Lifeboat School
OIC	Officer in Charge
QAWTD	Quick Acting Water Tight Door
QAWTH	Quick Acting Water Tight Hatch
PTT	Push To Talk



ACRONYM	DEFINITION
PSI	Pounds per Square Inch
RFO	Ready For Operations
R/W	Raw Water
R/G	Reduction Gear
SINS	Scalable Integrated Navigation System
WTD	Water Tight Door



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